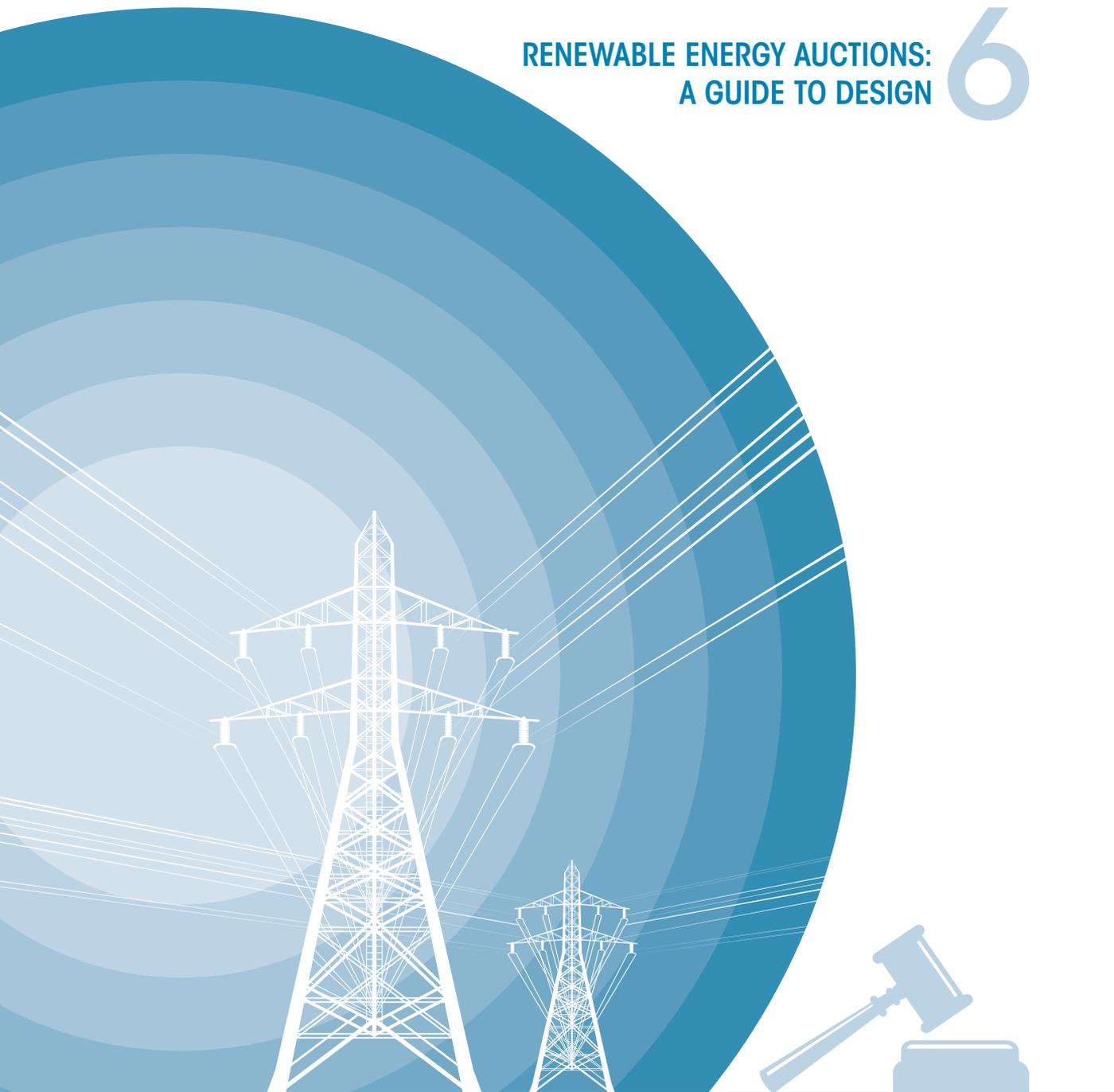


**RENEWABLE ENERGY AUCTIONS:
A GUIDE TO DESIGN**

6

**AUCTION DESIGN:
SELLERS' LIABILITIES**



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AUCTION DESIGN: SELLERS' LIABILITIES

2015

Contents

6	AUCTION DESIGN: SELLERS' LIABILITIES	
6.1	COMMITMENT TO CONTRACT SIGNING	12
	No specific commitments	12
	Bid bonds requirement	12
	Main Findings	14
6.2	CONTRACT SCHEDULE	14
	Lead time	14
	Contract duration	15
	Post-contract provisions	16
	Main Findings	17
6.3	REMUNERATION PROFILE AND FINANCIAL RISKS	18
	Straightforward escalation	19
	Hybrid contract indexation	22
	Variable remuneration profile	22
	Main Findings	22
6.4	NATURE OF THE QUANTITY LIABILITIES	25
	Capacity-oriented agreements	25
	Energy-oriented agreements	26
	Financial agreements	26
	Main Findings	27
6.5	SETTLEMENT RULES AND UNDERPERFORMANCE PENALTIES	28
	Temporal aggregation	28
	Over and underperformance provisions	29
	Revising the contracted quantity	29
	Main Findings	31

6.6	DELAY AND UNDERBUILDING PENALTIES	32
	Completion bonds	32
	Delay-specific penalties	33
	Contract resolution clauses	35
	Main findings	36
6.7	ASSIGNED LIABILITIES FOR TRANSMISSION DELAYS	38
	Liabilities assigned to the project developer	38
	Liabilities assigned to another agent	39
	Main Findings	42
	REFERENCES	44

Figures

Figure 6.1	Overview of the considerations related to sellers' liabilities	11
Figure 6.2	Inflation-indexed contracts: The case of Brazil and India	20
Figure 6.3	Evolution of real remuneration subject to different financial risks	21
Figure 6.4	Comparison of the remuneration under VGF mechanism and regular PPA	23

Boxes

Box 6.1	Bid bond requirements: The case of California	12
Box 6.2	Bid bond requirements: The case of Brazil, Germany and Peru	13
Box 6.3	Mitigating inflation risks through contract durations: The case of India	16
Box 6.4	Mitigating inflation risks through indexation: The case of Brazil and India	20
Box 6.5	Mitigating currency exchange risks: The case of India	21
Box 6.6	Variable remuneration profiles: The case of China and India	23

Box 6.7	Performance penalties: The case of Brazil and California.	30
Box 6.8	Completion bond requirements: The case of Germany	32
Box 6.9	Delay penalties: The case of France and the UK	34
Box 6.10	Delay penalties: The case of Brazil.	35
Box 6.11	Delay penalties: The case of Peru	36
Box 6.12	Delay penalties: The case of Denmark	37
Box 6.13	Transmission related delays: The case of Brazil	40
Box 6.14	Evolution of grid access policies in Brazil.	41

Tables

Table 6.1	Summary comparison of contract signing options	14
Table 6.2	Summary comparison of contract lead time options	17
Table 6.3	Summary comparison of contract schedule options	18
Table 6.4	Summary comparison of remuneration and financial risk mitigation options	24
Table 6.5	Summary comparison of quantity liability options	28
Table 6.6	Summary comparison of settlement rule options	31
Table 6.7	Overview of wind project delays: The case of Brazil (as of September 2014)	35
Table 6.8	Summary comparison of delay or underbuilding penalty options ...	38
Table 6.9	Summary comparison of transmission delay liability options.	43

Glossary

The following definitions reflect the nomenclature used by the International Renewable Energy Agency (IRENA) and are strictly related to the renewable energy industry; definitions used by other organisations and publications may vary.

Auction: Auctions refer to competitive bidding procurement processes for electricity from renewable energy or where renewable energy technologies are eligible. The auctioned product can be either capacity (MW) or energy (MWh).

Auction demand bands: Different categories within the total demand of an auction that require specific qualification requirements for submitting the bid (e.g. demand bands dedicated to specific technologies, project sizes, etc.).

Auctioned volume: The quantity of installed capacity (e.g. MW) or electricity generation (e.g. MWh) that the auctioneer is aiming to contract through the auction.

Auctioneer: The entity that is responsible for setting up the auction, receiving and ranking the bids.

Bid: A bidder's offer for the product awarded in the auction – most usually a power purchase agreement for the renewable energy generation or capacity.

Bidder: A physical or juridical entity that submits its offer in the auction process. Also referred as project developer, seller.

Levelised cost of electricity (LCOE): The constant unit cost of electricity per kWh of a payment stream that has the same present value as the total cost of building and operating a power plant over its useful life, including a return on equity.

Power Purchase Agreement (PPA): A legal contract between an electricity generator (the project developer) and a power purchaser (the government, a distribution company, or any other consumer).

Project developer: The physical or juridical entity that handles all the tasks for moving the project towards a successful completion. Also referred as seller and bidder, since the developer is the one who bids in the auction.

Off-taker: The purchaser of a project's electricity generation.

Overcontracting capacity: Contracting more capacity than the auction volume.

Underbidding: Offering a bid price that is not cost-recovering due to high competition and therefore increasing the risk that the projects will not be implemented.

Underbuilding: Not being able to bring the project to completion due to underbidding.

Undercontracting capacity: Contracting less capacity than the auction volume.

Acronyms

ANEEL	Agência Nacional de Energia Elétrica (Brazil)
BNEF	Bloomberg New Energy Finance
BNDES	Brazilian National Development Bank
CCEE	Câmara de Comercialização de Energia Elétrica (Chamber for Commercialisation of Electrical Energy, Brazil)
COD	Commercial Operation Date (or deadline)
CSP	Concentrated Solar Power
DEA	Danish Energy Authority
DEWA	Dubai Energy and Water Authority
DOE	Department Of Energy (South Africa)
EIA	Environmental Impact Assessment
EC	European Commission
EPC	Engineering, Procurement and Construction
EPE	Empresa de Pesquisa Energética (Energy Research Company, Brazil)
EU	European Union
FEC	Firm Energy Certificates
FIP	Feed-In Premium
FIT	Feed-In Tariff
GDP	Gross Domestic Product
GNI/CAP	Gross National Income per Capita
IEA	International Energy Agency
IOU	Investor-Owned Utility
IPP	Independent Power Producer
kWh	kilowatt-hour
LCR	Local content requirements

MASEN	Agence Marocaine de l'énergie Solaire (Moroccan Agency for Solar Energy)
MEMEE	Ministry for Energy, Mines, Water and the Environment (Morocco)
MEN	Ministerio de Energía y Minas de Perú (Ministry of Energy And Mines of Peru)
MME	Ministério de Minas e Energia (Ministry of Mines and Energy, Brazil)
NDRC	National Development and Reform Commission (China)
NEA	National Energy Administration (China)
NERSA	National Energy Regulator of South Africa
NFFO	Non Fossil Fuel Obligation (UK)
NREAP	National Renewable Energy Action Plan
NREL	National Renewable Energy Laboratory
NSM	National Solar Mission (India)
PPA	Power Purchase Agreement
PROINFA	Programme of Incentives for Alternative Electricity Sources (Brazil)
PV	Photovoltaic
RAM	Renewable Auction Mechanism
REC	Renewable Energy Certificate
RPO	Renewable Purchase Obligation
RPS	Renewable Purchase Standard
REIPPP	Renewable Energy Independent Power Producer Procurement (South Africa)
TSO	Transmission System Operator
VGf	Viability Gap Funding
WTO	World Trade Organization



6 Auction design: Sellers' liabilities

The sellers' liabilities are chiefly associated with the characteristics of the product being auctioned, and they encompass responsibilities and obligations spelled out in the auction documents. This class of design elements involves: 1) the *commitment to contract signing*; 2) the *contract schedule*; 3) the *remuneration profile and financial risks*; 4) the *nature of the quantity liabilities*; 5) the *settlement rules and underperformance penalties*; and 6) the *penalties for delay and underbuilding*. Figure 6.1 summarises these design elements, which are further developed in the chapter.

Figure 6.1: Overview of the considerations related to sellers' liabilities

<p>Commitment contract signing</p> <p>The choice of requiring bid bonds or not</p>	<p>Settlement rules and underperformance penalties</p> <p>Critical obligations with an effect on the plant's remuneration, addressed as:</p> <ul style="list-style-type: none"> » Temporal aggregation clauses » Over-and underperformance penalties » Revisions of contracted quantity
<p>Contract schedule</p> <ul style="list-style-type: none"> » Lead time - lag for plant construction » Contract duration - commitment length » Post - contract provisions - plant's ownership at the contract's end 	<p>Delay and underbuilding penalties</p> <p>Critical rules for a high implementation rate of the awarded projects:</p> <ul style="list-style-type: none"> » Completion bon » Delay specific penalties » Contract resolution clauses
<p>Remuneration and financial risks</p> <p>Aims to avoid financial risks (usually inflation) that might affect the remuneration:</p> <ul style="list-style-type: none"> » Straightforward escalation » Hybrid contract indexation » Variable remuneration profile 	<p>Liabilities for transmission delays</p> <p>The liabilities can be assigned to the project developer or to another agent (TSO, the central planning agency, etc.)</p>
<p>Nature of quantity liabilities</p> <p>Defines the nature of commitment assumed by the project developer, which is directly related to the allocation if risk: capacity-, energy- or financial oriented agreements</p>	

6.1 COMMITMENT TO CONTRACT SIGNING

A common concern of auctioning processes is to what extent the project developer's bid is a binding commitment, since most liabilities are enforced by the power purchase agreement, signed only after the auction is complete and the winners are announced. Renewable energy auctions involve either 1) *no specific commitments* at the bidding round or 2) *bid bonds*, requiring bidders to provide an initial deposit that would be lost in case the selected bidder withdraws the offer.

No specific commitments

Adopting no specific commitments typically relies on developers not withdrawing their offers in the period between the auction and the contract signing. Although this could be the case if this waiting period is short, there are records of bidders backing down on their offers despite these conditions, as has occurred in California (see Box 6.1).

BOX 6.1: BID BOND REQUIREMENTS: THE CASE OF CALIFORNIA

The Renewable Auction Mechanism (RAM) in California contains several provisions to ensure that only competitively priced products will be procured and that the winning projects will be developed. These include strict qualification requirements as well as requirements for development and performance deposits after signing the contract. However, no bid bonds are required for participating in the auction (see Box 4.1).

The large number of projects that passed the first auction stage based on documentation requirements suggests that the majority of bids are based on realistic projections and reasonably well-developed projects. However, the fact that many developers have withdrawn their offers after winning the auction raises questions about whether those bids were speculative. For example, in one of the investor-owned utilities (IOUs), out of the 51 awarded projects during all four bidding rounds, only 35 contracts have been executed, with 16 bidders withdrawing their bid. In another IOU, 4 bids have been withdrawn out of the 17 winning projects.

This suggests that additional features could be incorporated into the RAM to deter this behavior in future auctions. Since there are no bid bonds and the development deposits are required only after signing the contract, developers might revoke their offers after being selected but before signing the contract. The rules could be modified to require developers to post bid bonds, which would be refunded for the rejected bids, as in the case of Germany, Brazil, and Peru (see Box 6.2). Alternatively, a penalty could be imposed directly on developers who withdraw projects after a winning bid.

Source: (Wentz, 2014).

Bid bonds requirement

Requiring bid bonds typically implies a greater certainty that the contracts will be signed. Since the bidders would not get their bond amount back unless they

comply with the offer submitted in the auction, they will have an incentive to avoid “adventurous” bidding, a common concern of auction mechanisms.

One potential downside, however, is that issuing bid bonds requires the auctioneer to manage a large number of deposits, especially if the auction attracts a large number of bidders – and it can be argued that the benefits of this approach do not justify the added transaction cost on the auctioneer’s side, in a system that can already be complex. Bid bonds also impose some burden on potential bidders, especially on small and/or new players, although this is almost negligible compared to the costs of developing the renewable energy project, and bidders often must fulfil much more constraining requirements to participate in the auction (see Chapter 4). Germany implements a mechanism with different bid bond levels, in which a lower bid bond is accepted in case the bidder has already secured the building permit. This arrangement decreases the burdens, facilitating the participation of smaller players. This case is illustrated by Germany as presented in Box 6.2, along with the bid bond requirements in Brazil and Peru.

BOX 6.2: BID BOND REQUIREMENTS: THE CASE OF BRAZIL, GERMANY, AND PERU

Brazil

Bidders are required to deposit a bid bond equal to 1% of the estimated project cost, which must be declared by the investor and approved by the regulator beforehand. This guarantee is returned after the contract is signed if the investor wins the auction; otherwise, it is returned after the auction.

Germany

In Germany’s 2015-2017 solar auctions, each bidder must provide a bid bond worth per 4.5 USD/kW (4 EUR/kW¹) to be installed in order to be considered in the auction. This deposit is reduced to 2.27 USD/kW (2 EUR/kW) if the bidder already has a building permit, as this eases the after-auction work and decreases the auctioneer’s risk of not having a signed contract. Lowering the bid bond also can facilitate the participation of smaller players. The regulatory agency, Bundesnetzagentur, sorts the bids starting from the lowest to highest price, and projects are selected until the auction volume has been filled. Bids beyond the auction volume do not receive the right to remuneration for their output and get their bid bond back.

¹An exchange rate of 1.13 USD/EUR was used, compatible with the exchange rate in end 2014-early 2015

Peru

In the 2013 auction, bidders were required to deposit a bid bond for 50 000 USD/MW of capacity installed which is lost if the bid is won and the bidder fails to sign the contract.

Sources: (Bloomberg New Energy Finance, 2015), (IRENA, 2013a), (Ecofys, 2013), (Del Río, Linares, 2014), (Ministry of Energy and Mines, 2013)

Main Findings

Even though there are some auction implementations that do not apply bid bonds, it is likely that most future implementations will converge to introducing this type of commitment. Introducing a bid bond requirement typically involves a small cost (both in terms of mechanism complexity and in terms of the burden imposed on the bidders), and it has the benefit of greatly reducing the likelihood that contracts will fail to be signed after the auction. Bid bonds are particularly useful when bureaucratic procedures may result in a long waiting period between the awarding of contracts via the auction and the signing of those contracts.

A summary comparison of the different commitments related to contract signing is presented in Table 6.1.

Table 6.1: Summary comparison of contract signing options

Criteria \ Options	No specific commitments	Bid bonds requirements
Avoided undercontracting	 Riskier	 Much safer, although it does not totally guarantee the bidders' project completion
Simplicity	 Very simple	 Slightly higher transaction costs
Participation of bidders	 No constraints	 Very slight additional burden imposed on bidders

Characteristics of the relevant attribute:  Poor  Medium  Very good

6.2 CONTRACT SCHEDULE

It is important that the auctioned product clearly determines a schedule for the project developer as well as associated liabilities. The most important elements to consider are: 1) the *lead time*, which involves the time granted for the construction of the project; 2) the *contract duration*, reflecting the length of the commitment implied by the auctioned product; and 3) *post-contract provisions*, which typically are associated with plant ownership after the contract's end date. In general, the contract schedule can vary significantly, and various different combinations can result in a successful auction implementation.

Lead time

The lead time is a key attribute of renewable energy auctions that ensures project developers will have enough time to complete the power plants before the contract

begins. However, excessively generous lead times might attract some speculative bidders – for example, those who plan to delay the beginning of construction in anticipation of reductions in development costs. Even though construction times are relatively well-known for each type of renewable energy power plant, substantial administrative requirements that must be met after the auction might take significantly more time (see Section 4.3 for site-specific documentation and Section 6.1 for bureaucracy involving signing the contract). Therefore, it may be prudent to devise a schedule that adequately considers these requirements.

Several auction design alternatives seek to offer more flexibility to the auction winner with respect to lead time. For example, the lead time may begin at the point of contract signing, rather than at the point that the auction is held (see Section 6.2). This can be an attractive provision when there is a risk that the contract signing process will be lengthy and will compromise the construction schedule. It is also possible to let bidders suggest their desired lead time, taking this variable into account in the winner selection process (see Section 5.3). Yet another possibility is to include provisions to anticipate the contract's starting date in case the plant is completed earlier than anticipated. Many of these possibilities offer incentives for generators to start operations as soon as possible, and they can be effective additions to the auction design.

Contract duration

Contract duration varies greatly among renewable energy auctions, although a common strategy is to calibrate the duration so it is close to the plant's likely useful life. In this case, the project developer can avoid the burden of estimating the plant's residual value once the contract terminates – which would otherwise be an important component of the developer's remuneration – and considerations on post-contract provisions (see below) become less important.

In addition, to ensure the new projects' bankability, the contract duration should be compatible with the duration of the typical financing maturity given by banks. Latin American countries, such as Brazil and Peru, follow this rule when setting the contract duration. In Uruguay, the contract length is proposed by bidders and included in the bidding documents, and should be between 10 and 20 years. To minimise the risks and to increase the projects' bankability, all submitted proposals asked for a 20-year PPA.

Moreover, the contract duration can be selected in a way that reduces risks associated with inflation. For example, in Brazil, the contracts are indexed to inflation to ease financing and reduce risks for developers (see Box 5.5), while the Indian state of Uttar Pradesh attempted to shorten the contract's length in order to mitigate inflation risks to investors (see Box 6.3).

BOX 6.3: MITIGATING INFLATION RISKS THROUGH CONTRACT DURATIONS: THE CASE OF INDIA

In its decentralised auction, the Indian state of Uttar Pradesh adopted an interesting design to raise project developers' interest in a contract that was not indexed to price inflation. The state lowered the contract duration from the default 25 years to 10 years, after which project developers would be able to sell the electricity at market prices.

Project developers could find this policy very attractive if electricity market prices are expected to escalate approximately according to inflation over the years – offering the possibility of raising long-term revenues. After a decade, the contract remuneration would have lost a major portion of its value, and this trend would have continued until the end of the 25-year contract. Thus, terminating the agreement early could be beneficial for the investor.

At the same time, the bankability of the project can still be ensured as long as the PPA covers the period of loan repayment – even if a 10-year contract does not offer the same income security as a 25-year contract – as it is most critical to lenders and investors that the project has a stable revenue stream. Seeing that most financing agreements tend to have a duration of only around 10 years, this condition would be met by the Uttar Pradesh auction design.

In practice, however, Uttar Pradesh's 10-year PPA was perceived mostly negatively by bidders, as the increased uncertainty in remuneration after the PPA ends was seen as a major downside. This perception, coupled with the difficult financial situation of the state's distribution company, resulted in an insufficient number of bids to cover the auction demand entirely. The lower competition led to higher prices compared to other Indian states which were organising renewable energy auctions in the same period (see Box 5.13).

Sources: (Elizondo-Azuela, Barroso et al., 2014), (Pillai, Banerjee, 2009).

Post-contract provisions

Post-contract provisions are associated with the way project developers may account in their financial models for any residual revenues from their investment after the contract's termination. This element is especially important if contract durations are short, since a considerable share of the developer's revenue will be associated with electricity market price sales after the contract's end date. In these cases, project developers often maintain ownership of the generation assets after that date. Alternatively, certain auctions involve build-operate-transfer instruments, according to which the assets are fully transferred to the government after the contract's termination – in which case it is important to clearly communicate this aspect from the beginning.

Main Findings

The specific provisions that define the contract schedule can vary substantially from one auction implementation to another, although there tends to be more or less a consensus on the rationale used to determine those parameters. A contract's lead time, for example, is typically defined based on reasonable expectations for (technology-specific) construction time and administrative procedures. If the lead time is shorter than needed, the project developer will have very little room for error, resulting in a higher risk of delays that may be penalised. However, excessively long lead times may lead to some degree of speculation, as the project developer delay purchasing the equipment for several months hoping the cost of technology will fall. A summary comparison of different options for the contract lead time are presented in Table 6.2.

Table 6.2: Summary comparison of contract lead time options

Options	Lead time	
	Shorter	Longer
Reducing uncertainties to investors	 High risk of penalties in case of delays	 Comfortably accommodates construction time
Avoiding risks of delays	 Greater risk	 More comfortable schedule
Ensuring that projects will be brought to completion	 Risk of contract termination in case of excessive delays	 Might encourage speculation with equipment prices

Characteristics of the relevant attribute:  Poor  Medium  Very good

In addition, provisions that determine the contract's duration and asset ownership once the contract terminates chiefly affect the project developer's cashflow projections – and, by consequence, the bid price during the auction. In general, it is desirable to offer a contract duration that is at least compatible with the maturity of typical financing contracts, seeing that this greatly increases the project's ability to secure bank loans. A summary comparison of different alternatives for the contract schedule are presented in Table 6.3.



Table 6.3: Summary of contract schedule options

Options Criteria	Contract duration		Post-contract provisions	
	Shorter	Longer	Project developer maintains ownership	Assets transferred to the government
Investors confidence	More volatile revenues after contract ends	Predictable cashflows for the entire useful life of the plant	Requires estimating residual value	Zero value after contract ends if rules are clear
Level of participation	May be an obstacle to financing if too short	Comfortably accommodates maturity period for financing	Standard approach in liberalized markets	No major obstacles if rules are well-defined
Liabilities to the demand side	Short period	Long period	Terminated with the contract	Retained along with plant ownership

Characteristics of the relevant attribute:  Poor Medium Very good

6.3 REMUNERATION PROFILE AND FINANCIAL RISKS

In principle, the type of auctioned product (installed capacity or energy produced) plays an important role in stabilising the project developer’s remuneration throughout the contract’s duration. However, even if a winning project is developed and produces electricity exactly as declared in the bid (performance-related liabilities are addressed in Sections 6.4 and 6.5), its contract remuneration might vary over time, and it may be subject to certain financial risks. There are two main types of financial risks that a project developer faces throughout the contract duration: risks associated with currency exchange rate and those associated with inflation. Both of these risks’ implications and the ways to mitigate them are discussed in this section. In this sense, auctioned contracts can be categorised as follows: 1) *straightforward escalation*, which is the simplest alternative, as it typically only involves one reference index; 2) *hybrid contract indexation*, which involves more-complex escalation provisions with additional modifiers and conditions; and 3) a *variable remuneration profile*, which refers to contracts in which the project developer’s remuneration profile shifts during the contract duration.

Straightforward escalation

Straightforward escalation clauses are used to minimise the contract's complexity, but they still allow for a wide range of implementations for reducing the financial risk of project developers. For example, in Chile, the auctioned contracts are denominated in US dollars and adjusted periodically according to the US Consumer Price Index (CPI), which implies that developers are shielded from both interest rate risks and inflation risks. A similar scheme is being considered in India (see Box 6.5), where so far the contracts offered have been nominated in Indian rupees, with no adjustment for inflation. An intermediate example is Brazil, where contracts are nominated in Brazilian reals but adjusted yearly for domestic price inflation. These three examples of straightforward escalation methods differ in the risk allocation between the consumer and the project developer (see Box 6.4). Other alternatives, such as promoting escalation of the contract price at a flat annual rate, are also possible. No escalation, as in the case of India, represents straightforward escalation at a flat annual rate equal to zero.

Although all of the above alternatives are viable, it generally is preferable to shield project developers from financial risks if they are likely to price those risks very highly. For example, nominating a price in foreign currency could be a suitable option if the national currency is not very strong. Furthermore, different escalation clauses may favour foreign investors over domestic ones or vice versa – another topic that should be assessed by policy makers.

To protect developers from the currency exchange risk, the Indian government is considering offering dollar-nominated contracts. However, the lower, but still existing dollar inflation risk will not be hedged against. The plan aims to take advantage of hedging over the long-term dollar-rupee exchange rate outlook, as explained in Box 6.5.



BOX 6.4: MITIGATING INFLATION RISKS THROUGH INDEXATION: THE CASE OF BRAZIL AND INDIA

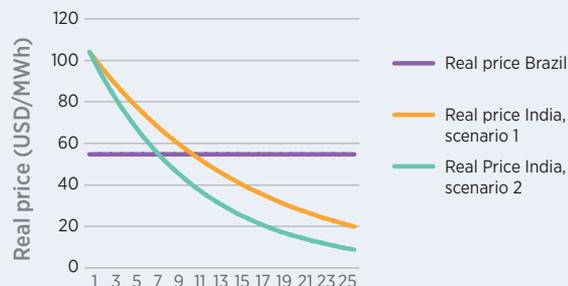
A key component in designing a contract's remuneration profile is the risk allocation between consumers and producers. One important aspect is inflation, which is even more critical in emerging and developing economies as it can run at high rates. In the absence of long-term hedging markets, project developers' revenues could become insufficient to cover investment costs.

To shield developers from such a risk, contracts are often indexed to inflation, meaning that the contract remuneration will escalate in nominal terms. Brazil, Peru and South Africa are examples of countries where such indexing occurs. In contrast, when contracts are not escalated, developers must price this risk when submitting a bid to the auction, being aware that the contract will likely lose value over time in real terms. In India, where most contracts offered in national and state auctions are not indexed to inflation, several mechanisms have been devised to mitigate the impact of the high hedging costs, such as shortening the duration of the auctioned contracts (see Box 6.3) and offering a large portion of the remuneration upfront (see Box 6.6).

Figure 6.2 shows the difference between the remuneration profiles of solar PPAs in India and Brazil, two developing countries with relatively high inflation. The International Monetary Fund's (IMF's) forecasts from October 2014 suggest an average consumer price inflation of 5.1% annually for Brazil and 6.5% annually for India during 2014-2019. Using the prices of recent auctions in both countries¹ (54.7 USD/MWh in Brazil and 104.0 USD/MWh in India²), the evolution of the real price over 25 years (contract length) is analysed. Since Brazilian tariffs are indexed to inflation, they will have the same real value during the length of the contract, while the Indian tariffs will lose value over time, subject to inflation.

Two scenarios of inflation have been analysed in India, to show how investors' risk-aversion and hedging against the most extreme downside scenarios may affect perceptions of the value of the contract. Scenario 1 reflects a constant inflation of 6.5% per year (as per the IMF's forecasts), whereas Scenario 2 reflects a scenario in which inflation was 9.5% per year (average of the past five years).

Figure 6.2: Inflation-indexed contracts: The case of Brazil and India³



¹ The auctions surveyed were Brazil's solar auction of September 2014 and the auctions in the Indian states of Andhra Pradesh and Rajasthan in February 2013.

² Brazilian price: BRL 142.3/MWh, exchange rate: BRL 2.6/USD. Indian price: INR 6.45/kWh, exchange rate: INR 62/USD.

³ Matters such as the different dates of the auctions were not taken into account for simplification. The figure is an attempt to illustrate the impact of indexation rather than to provide precise quantitative results.

Source: (Elizondo-Azuela, Barroso et al., 2014).

BOX 6.5: MITIGATING CURRENCY EXCHANGE RISKS: THE CASE OF INDIA

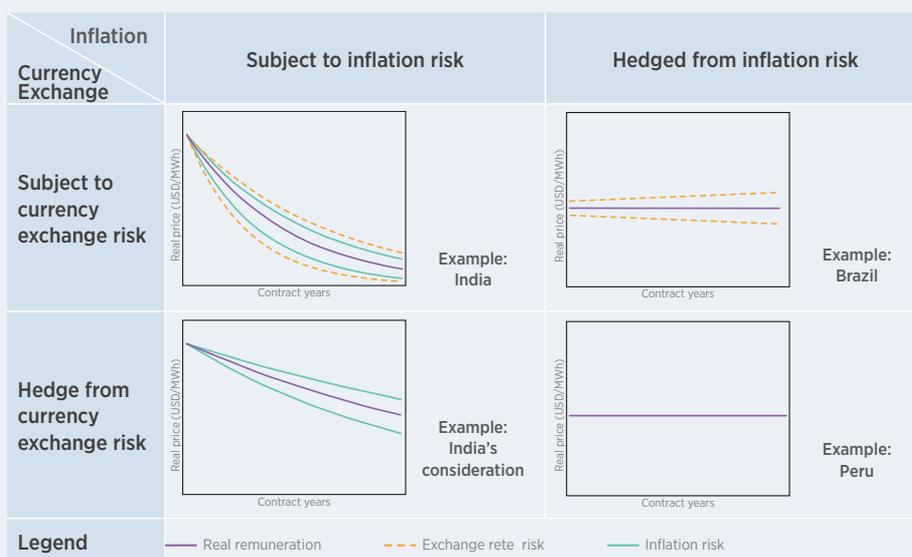
Currently, the renewable energy contracts offered in India's solar auctions are denominated in Indian rupees and are not indexed to inflation, resulting in a high hedging cost of around 6.5%. To reduce these costs and to help developers access international capital, the government is considering offering PPAs denominated in US dollar terms. Under this arrangement, developers would quote their bids in dollars while tying up solar power for 25-year contracts, but consumers are charged in rupees. A hedging cost of 1.5 US cents would then be added to the tariff, which would be pooled in an account used to cover depreciation in the value of the rupee – effectively transferring risks from the investor to the consumer.

The underlying idea is that pooling the hedging costs and putting the government's weight behind it will greatly reduce the cost of currency hedging on the market. This would reduce the cost of capital and thereby the cost of solar power, making it more attractive. The ministry expects to generate a "hedge fund" of approximately USD 1 billion, which would be enough to cover 3% depreciation in the value of the rupee over the 25-year contract. However, this is not a completely costless endeavor – if the rupee devalues by 5% against the dollar (for example), the pool would be sufficient for 15 years only.

Because expectations for the US dollar inflation are much smaller than the Indian rupee inflation, this mechanism could reduce the nominal solar tariffs approved in the auction by as much as 40%, mainly due to the mechanism described in Box 6.4. Furthermore, it is also likely that the cost of allocating currency risks to the consumer, estimated at INR 0.90/KWh (1.5 USD cents/KWh), may be lower than the hedging costs as perceived by individual project developers.

Figure 6.3 illustrates how different financial risks influence the project's remuneration. As observed, the current contract arrangement in India exposes the developer most, being subject to both inflation and currency exchange risk. In Brazil, the contracts are indexed to inflation, the remaining financial risk being the currency exchange uncertainties (market with the blue lines). Peru presents the most favorable environment for the project developers, as the contracts are both denominated in dollar and indexed to inflation.

Figure 6.3: Evolution of real remuneration subject to different financial risks



Source: (Elizondo-Azueta, Barroso et al., 2014).

Hybrid contract indexation

Hybrid contract indexation schemes are modified versions of the straightforward escalation schemes, with typically more than one index taken into account. One way to implement hybrid indexation is to “split” the auctioned price into two portions for subsequent years: the first portion would be escalated according to one index, and the second period according to another index. This type of scheme has been adopted in certain French renewable energy contracts, where total remuneration is split into three proportional parts, with the first portion being escalated according to the producer price index (a proxy for operational costs), the second portion according to the cost of labour (a proxy for expenses with personnel), and the remainder not escalated and remaining constant in nominal terms (a proxy for capital remunerations).

An alternative version of hybrid indexation schemes involves a cap on the adjustment according to indexation. In Brazil, a solar power auction in the state of Pernambuco offered a contract with this type of provision: the project developer’s remuneration would be escalated according to the consumer price index, unless the adjustment of the electricity tariff for industrial consumers is lower than this limit. Provisions that cap yearly adjustments to a certain fixed value (such as 5%) are also not uncommon.

Variable remuneration profile

Due to the flexibility in designing auctions, long-term contracts do not necessarily involve a stable level for the yearly payments. Variable remuneration profiles are associated with predictable, sharp changes in the project developer’s remuneration profile at some time during the contract. This type of arrangement is often used as a mechanism to offer greater revenues to the project developers during the first years, which are most important for financing (this is the case in China, as explained in Box 6.6) – although it typically implies additional complexity that must be factored in by potential suppliers. There might be other circumstances in which variable remuneration profiles can be a defensible strategy: in some cases, for example, a disbursement schedule concentrated in the first few years of the contract may be beneficial to the demand side as well. This has been the case of India’s Viability Gap Funding mechanism (see Box 6.6) – in which there was a desire to reduce the long-term effect on tariffs by using a government fund.

Main Findings

In theory, as long as there is an efficient financial market that allows project developers and consumers to hedge against risks and smoothen their remuneration profile over time according to their needs, the remuneration profile featured in the contract should not be crucial for the auction outcome. In practice, however, it can be costly for the project developer to procure these financial products – which

BOX 6.6: VARIABLE REMUNERATION PROFILES: THE CASE OF CHINA AND INDIA

China and India have adopted variable remuneration for PPAs, with China's remuneration based on the energy delivered and India's on upfront subsidy payment which reduces the contract's fixed price.

China

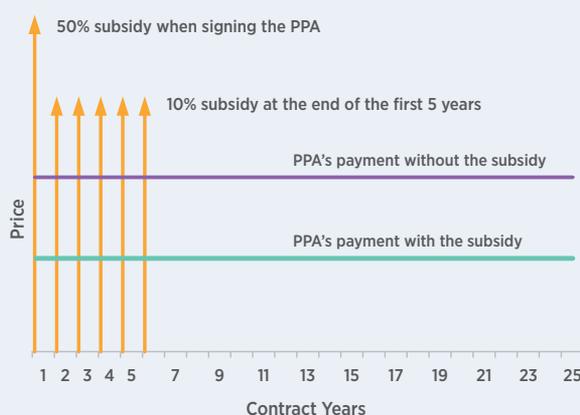
China, meanwhile, implemented a variable remuneration profile based on the energy delivered. The PPAs are signed for a period of 25 years, during which the project developers receive the tariff resulting from the auction only for the first 30 000 full load hours. For the remainder of the contract, the remuneration decreases, converging to the average market price.

This payment scheme aims to avoid over-compensation and to provide a greater safety net to investors during the period of loan repayment. It guarantees a higher income in the first years (usually 30 000 full hour loads are covered in around 10 years), which matches the approximate period of loan repayment, ensuring the project's bankability and easing financing.

India

Phase II of India's National Solar Mission (NSM) auctions introduced a very specific variable remuneration profile called Viability Gap Funding (VGF). In this scheme, the remuneration of the winning bid involves a subsidy that reduces the upfront capital cost, with 50% of the funding received when signing the PPA and the other 50% split equally over the first five years of the PPA (10% at the end of each year) (Figure 6.4). The long-term revenue for plants participating in these auctions would be ensured by a 25-year PPA, but with a considerably lower price than in a case where no subsidy is given.

Figure 6.4: Comparison of the remuneration under VGF mechanism and regular PPA



Sources: (Elizondo-Azuela, Barroso et al., 2014).

often leads to allocating most of the risk to the consumer. Shielding investors from risks related to inflation and exchange rate by means of a straightforward escalation implementation can reduce the cost of financing the project and decrease the price resulting from the auction. However, these arrangements also imply increased risk for the consumers. There are examples of successful auctioning schemes in which the developers assume some financial risks partially or fully.

Regardless of whether risk is mostly allocated to developers or to consumers, straightforward escalation clauses remain the most common choice of implementation for renewable energy auctions. Nonetheless, innovative variations to the contract profile have emerged in several jurisdictions which seek to offer a contract that is better tailored to the investors' needs at minimal cost to the consumer. In the case of hybrid indexation alternatives, for example, more specific price indices are used, rather than general inflation indices, to estimate generators' cost structure. Similarly, a variable remuneration profile can cater to the fact that investors' cashflow is most strained in the debt repayment period.

A summary comparison of the different alternatives for remuneration and addressing financial risk is presented in Table 6.4

Table 6.4: Summary comparison of remuneration and financial risk mitigation options

Options Criteria	Straightforward escalation: generator absorbs most risks	Straightforward escalation: consumer absorbs most risks	Hybrid contract indexation	Variable remuneration profile
Simplicity	 Straightforward	 Requires escalation clauses	 High complexity indexation	 Requires rulings to adjust profile
Reduced uncertainties to investors	 Investors must seek hedging products	 Hedge against inflation and currency risk	 If well designed, cost-following	 Possibly better guarantees to financiers
Liabilities to the demand side	 Little risk left to consumers	 Consumer can dilute risks in its portfolio	 Consumer can dilute risks in its portfolio	 Liabilities reduced after first few years

Characteristics of the relevant attribute:  Poor   Medium   Very good

6.4 NATURE OF THE QUANTITY LIABILITIES

Another important aspect of auction design is deciding how the seller's obligation to deliver renewable energy is determined in the auctioned product. This involves selecting one category of indicators to represent whether project developers have fulfilled their commitment. There are essentially three alternatives regarding the nature of the liabilities imposed on the supplier, which are directly related to the risk allocation on the demand side: 1) *capacity-oriented agreements*, which imply a commitment to maintain and operate renewable energy capacity (and no more); 2) *energy-oriented agreements*, which represent a physical commitment to deliver a given amount of renewable energy in an FIT-like arrangement; and 3) *financial agreements*, which impose greater responsibility on the developer, since the generator may be exposed to fluctuations in the electricity spot price.

Capacity-oriented agreements

Capacity-oriented agreements represent the least amount of commitment on the project developer's side, since they are completely independent from the plant's actual output. To introduce some degree of price signaling in this type of scheme, suppliers may be required to ensure that generation facilities meet minimum availability standards (*i.e.*, number of operational hours per year, excluding failures and maintenance stops), and penalised in case these thresholds are not met.

Under this type of mechanism, project developers are perfectly hedged from energy-oriented risks, so this can be a way of reducing the price of the auctioned contract. In addition, this approach may attract a larger number of bidders, especially small and/or new players who otherwise would not be able to easily absorb the underlying risks.

Capacity-oriented agreements are adopted mostly when the resource availability is unpredictable. This type of contract does not offer incentives for the bidder to choose high-performing sites, and therefore it tends to be most suitable when the government is responsible for selecting possible locations (see Section 4.3). In this case, however, and even in project-specific auctions, a different liabilities scheme can be adopted, mostly to shield the consumers from potential downsides in case the government's initial site assessments were somehow miscalibrated – because, in these types of arrangements, the consumer takes on the production risk.

Still, the main disadvantage of capacity-oriented arrangements remains the risk that the project developer abandons the project after the contractual agreements are met, namely the capacity is installed, therefore not delivering the energy. The early experience in California with wind projects is a good reference. Starting in

early 1980s, wind energy investment grew substantially, leading to a total installed capacity of about 1 880 MW by 1990, as a result of tax incentives and capacity-oriented contracts. Shortly after 1990, the development slowed greatly and many projects ceased operation, resulting in the need to introduce production incentives (energy-oriented agreements) for new and existing projects.

Energy-oriented agreements

Energy-oriented agreements imply a higher level of responsibility on the part of suppliers, as they commit to providing a certain quantity of electricity generation throughout the contract's duration. This type of agreements encompasses typically the main characteristics of renewable energy support schemes. In energy-oriented agreements, any positive or negative deviations from the agreed quantity are always settled within the scope of the contract itself, and in this sense, the agreements often resemble FIT mechanisms. Remuneration is proportional to the total electricity generated, regardless of the time of delivery. In Brazil, for instance, the performance assessment is carried out for the yearly average generation and for the cumulative four-year generation (see Box 6.8).

In an energy-oriented agreement, the consumer implicitly assumes all risks associated with the “value” of electricity at the time when the renewable power is delivered (which is measured by the electricity spot price): for the purpose of verifying the generator's compliance with its contractual commitment, energy delivered during the night is as valuable as energy delivered during peak hours. On the other hand, the generator still assumes some responsibility, seeing that if the plant systematically underperforms or overperforms on average the project developer's remuneration will be affected. In addition, energy-oriented agreements have the benefit of familiarity, as they closely relate to FIT agreements. For those reasons, energy-based quantity liabilities tend to be among the most common implementations in renewable energy auctions and have been adopted, for example, in China, India, Italy and the Netherlands.

Financial agreements

Whereas in capacity-oriented agreements the project developers commit just to installing the renewable energy capacity, and in energy-oriented contracts they commit to delivering a certain amount of electricity during the contract's duration, financial agreements more closely resemble “standard” forward contracts, committing to a certain generation profile. In this type of agreement, any deviations between actual plant generation and the quantity committed in the contract must be settled at the electricity spot price in real time. Therefore, the contract profile, which defines the generation profile of the plant during the contract period, is an important element, as the commitment to deliver electricity is verified at each point in time.

In liberalised electricity markets, the electricity spot price is used to settle any deviations between the electricity generated and contractual commitments. This implies that, in capacity- or energy-oriented agreements, the consumer implicitly assumes the underlying price-quantity risks on the generator's behalf.

With financial agreements, in contrast, the generator assumes the responsibilities associated with the quantity committed in the auction. Whenever the generator delivers more than the contracted quantity, it will receive a surplus remuneration based on the spot price; and similarly whenever it generates less than the contracted quantity it must pay the spot price for this difference. One argument for allocating risk in this manner is that the generator might have some influence on the plant's ability to provide electricity (for example, by concentrating maintenance hours in low-priced periods, or by slightly adjusting technical specifications to prioritise generation during peak hours), whereas the consumer has no influence on the matter. Even though the increased risk allocated to the supplier is likely to translate into a slight price increase in the auctioned product, there are circumstances in which this implementation may be preferable – especially if there is a robust financial market for energy derivatives in which the renewable energy developer may adjust its contract position according to its own risk preferences.

Main Findings

The choice of quantity liabilities are associated with the desired risk allocation between generators and consumers. On the one hand, allocating most of the risk to the generator (as it is the case with liabilities based on financial agreements) may lead to cost increases, as the project developer must procure financial products to hedge against price-quantity risks associated with the inherently stochastic availability of the renewable energy resource. On the other hand, allocating too much risk to the consumer (as it is the case with capacity-oriented agreements) may lead to perverse incentives, particularly during the site selection and project design phase – when project developers' choices can directly affect the plant's future performance. One compromise between these two extremes adopted in several renewable energy auctions is the energy-oriented quantity liability, in which both generators and consumers assume some degree of risk. Financial agreements may also be an alternative in certain mature and liberalised electricity markets. Capacity-oriented implementations tend to be much rarer, as the risk of perverse incentives means that the applicability of these schemes is very limited.

A summary comparison of the different options for assigning quantity liabilities is presented in Table 6.5.

¹ One example is the possibility of adjusting the azimuth angle of solar panels, in order to prioritise generation during late afternoon hours (system peak), which could be attractive for the developer, depending on the spot price signals.

Table 6.5: Summary comparison of quantity liability options

Alternatives Criteria	Capacity-oriented agreements	Energy-oriented agreements	Financial agreements
Reducing uncertainties to investors	 After installing the agreed capacity, no other risks	 Both generators and consumers assume some risk	 Involves real-time settlements in the electricity spot market
Liabilities to the demand side	 Consumers are burdened with all production risks	 Downside risk if the plant generates mostly in off-peak hours	 Production risks are transferred to the generator
Price signals for performance	 Limited to penalties for unavailability	 Incentives to maximise delivered quantity	 Incorporates the implicit “value” of electricity

Characteristics of the relevant attribute:  Poor  Medium  Very good

6.5 SETTLEMENT RULES AND UNDERPERFORMANCE PENALTIES

As discussed in Section 6.4, the nature of the commitment assumed by the project developer can take many different forms. In general, deviating from the contractual obligations will have an effect on the plant’s remuneration, representing a departure from the “baseline” remuneration profile discussed in Section 6.3. Regarding these settlement rules, the following attributes can be addressed: 1) *temporal aggregation* clauses to assess over- or underperformance; 2) *over and underperformance provisions*, representing how the contract remuneration varies when the power plant delivers more or less than originally declared; and 3) *revising the contracted quantity*, referring to specific provisions that allow for the reduction of the commitment at the time of the auction.

Settlement rules are an important element of auction design primarily due to concerns about perverse incentives, which may lead developers to be rewarded for systematically over or underestimating their generation expectations. For example, in case of financial agreements, a project developer with a trading mindset may consider buying the electricity on the spot market instead of producing it, if the contract price is higher than the spot prices. In a sense, implementing more-sophisticated settlement rules is a way of adjusting price signals, attempting to ensure that the project developer’s declarations of expected renewable energy generation are realistic and that the remuneration is in line with it.

Temporal aggregation

Temporal aggregation relates to how often the power plant’s performance is assessed in order to determine whether its remuneration must be revised. Because renewable

generation, especially wind and solar, is stochastic in nature, there is always a chance that the generator may be “unfairly” classified as over or underperforming, simply due to random fluctuations. Longer aggregation periods imply that this type of event is less likely. However, they may increase the difficulty in identifying projects whose performance is indeed misestimated.

Yearly aggregations are the shortest possible time frame that allows seasonal aspects to be eliminated, and they are often used for temporal aggregation schemes. In certain implementations, however, one year is not considered long enough to accurately assess the long-term behavior of a plant, leaving the generator vulnerable to exceptional events (see Box 6.7). For example, in the first few months of the plant’s operation, substantial variations in the plant’s performance can occur. This may justify longer periods for temporal aggregation, such as the four-year settlements carried out in Brazil for wind power plants.

Over and underperformance provisions

Over and underperformance provisions aim to reduce deviations in the quantity of energy delivered from the amount specified in the contract and they represent an incentive for accurate estimation of this quantity. As such, these provisions need to ensure that the suppliers’ remuneration per energy unit is highest when the generation is in line with expectations. To that end, remuneration must fall more than proportionally when generation falls, and rise less than proportionally when generation rises. This type of mechanism is straightforward in the case of energy-oriented contracting (see Section 6.4). In capacity-oriented and financial agreements, underperformance provisions are usually implemented based on a revision of the contracted quantity instead (see below). California and Brazil are examples of jurisdictions that implemented specific provisions to address generators’ performance (see Box 6.7).

Revising the contracted quantity

Revising the contracted quantity is a way to adjust the project developer’s remuneration according to the actual performance of the power plant. In its most straightforward form, this involves adjusting future expectations (along with remuneration) at the end of each “cycle” (representing the reference period for the temporal aggregation). However, it also is possible to institute “tolerance bands”, so that a revision of the contracted quantity is triggered when the deviation between actual and expected generation surpasses a given threshold. In capacity-oriented agreements (in which reducing the “contracted quantity” translates into a direct reduction in remuneration) and financial agreements (in which the project developer could adopt the trading strategy described earlier), generators typically are penalised from having their contracted quantity reduced.

BOX 6.7: PERFORMANCE PENALTIES: THE CASE OF BRAZIL AND CALIFORNIA

Brazil: Underperformance penalties and over-performance compensations

In Brazil, the penalties for over- and underproduction vary depending on the renewable energy technology and the type of auction. For new energy auctions, penalties for underproduction are calculated annually and in a cumulative manner every four years:

- Annual underperformance penalties are applied when the average annual generation is less than 90% of the contracted amount. In this case, the developer must pay either: 1) the product of the average spot price in that respective year and the quantity not delivered; or 2) the product of the contract price and the quantity not delivered, whichever is higher.
- Given the variability of some technologies, a cumulative four-year performance assessment takes place. If the average four-year generation falls below the amount contracted, the developer must pay either: 1) the product of the average spot price of the four years and quantity not delivered; or 2) 1.06 times the contract price times the quantity not delivered, whichever is higher. The additional 6% over the contract price is a penalty for not delivering the contracted energy over the four years.

Upper limits are also established, so that any excess generation can be sold at the spot price. In the case of wind generation, the limit for the first, second, third and fourth year is set at 130%, 120%, 110% and 100% respectively, after which the cycle is repeated.

For reserve energy¹, the same bands for energy to be delivered are established, but the penalties for under-delivery and compensations for over-performance are not related to the spot price. In the case of the 2014 solar reserve auctions, the band was set between 90% and 115% of the contracted generation. If the tolerance upper bound is surpassed, surplus energy is purchased at a 30% discount on the contract price and the surplus is accumulated for accounting in the following year. If annual production is below 90% of the quantity contracted, the project developer is penalised, having to buy the difference at a 6% premium over the contract price, in addition to making up the deficit in the following year. The underlying logic is to take advantage of the large storage capacity of hydropower. By allowing a cumulative verification of the production obligations over a four-year period, the hydro reservoirs are being used to leverage the penetration of renewables.

California: Performance deposits

In the RAM auction programme in California, developers must commit a performance deposit after the completion of the project, which is held by the utility through the lifetime of the contract. Through this deposit, utilities require projects to: 1) ensure consistency with the generation profile described in the contract; 2) hold liability insurance against utility losses; and 3) deliver a minimum level of renewable electricity in any given two-year period. For projects 5 MW or less, the performance deposit is equal to the development deposit, and the funds are simply rolled over. Larger projects require 5% of the expected total project revenue as a performance deposit. In general, the requirements for development and performance deposits are designed to reduce risk to utilities, and hence consumers, from uncertainty surrounding distributed projects.

¹ Unlike regular auctions, which cover the distribution companies' demand, the reserve auctions are meant to ensure a security of supply margin in the system. However, in practice, they have been used as a renewable energy support mechanism.

Sources: (Cunha, Barroso, Bezerra, 2014), (Wentz, 2014).

In energy-based agreements, revising the contracted quantity aims to benefit suppliers rather than penalise them. In the classic version of this agreement, the developers' remuneration is proportional to the delivered electricity (implying that there is no need for a contracted quantity), and in the presence of harsh over- and underperformance provisions, it is to the project developer's advantage to adjust the contracted quantity so that it is as accurate as possible. Using this characteristic, it is possible to introduce voluntary mechanisms for revising the contracted quantity (rather than automatic revisions), in which the developer may periodically re-declare generation expectations. This can be an interesting provision to collect up-to-date information on renewable energy output expectations from the project developers.

Main Findings

Once the nature of the auction's quantity liability is defined (Section 6.4), another important decision is how to handle deviations between the generators' effective delivery and the commitments signed at the time of the auction. Multiple RE auction implementations introduce specific provisions to penalize project developers for underperformance and reward them for overperformance – and these mechanisms generally imply stronger incentives for correctly estimating a RE plant's long-term expected production. Even though the details of particular settlement rules can differ significantly between jurisdictions, there is a spectrum between very strict implementations (in which the generator tends to be penalized whenever it underperforms) and more forgiving ones (which give the generator the benefit of the doubt).

A summary comparison of the two extremes of this spectrum involving settlement rules and underperformance penalties is presented in Table 6.6.

Table 6.6: Summary comparison of settlement rule options

Alternatives Criteria	Settlement rules and underperformance provisions in general	
	Strict requirements / penalties	Loose requirements / penalties
Reduced uncertainties to investors	 Generators may be penalised for random, uncontrollable events	 Much smaller chance of generators being unfairly penalised
Liabilities to the demand side	 Generators assume a larger share of the risks	 Demand must accommodate the flexibility granted to the project developer
Avoided undercontracting	 More likely to quickly correct any errors in the plant's expected production	 May induce generators to overestimate their plant contributions on purpose

Characteristics of the relevant attribute:  Poor  Medium  Very good

6.6 DELAY AND UNDERBUILDING PENALTIES

Ensuring that renewable energy plants are built according to the contractual schedule is a legitimate concern of policy makers. The occurrence of delays in implementing the capacity contracted in early (and even more recent) auctions – many of them reportedly associated with underbidding – has resulted in particular attention being given to mechanisms aimed at avoiding implementation delays. These mechanisms include: 1) *completion bonds*, 2) *delay-specific penalties*, and 4) *contract resolution clauses*.

Completion bonds

A completion bond is a security required from the winner of an auction in case there are delays in project implementation. These bonds can range from security deposits to actual bonds issued by a guarantor (bank, insurance company). When actual bonds are employed, a good practice is to require that the underlying (bond) contract reproduces the clauses of the contract awarded as a result of the auction, in order to avoid lengthy interactions with the guarantor that may result in significant time lags for receiving the payment. Constraints on which banks or insurance companies are accepted as guarantors also may be adopted.

Completion bonds are commonly used because of their straightforwardness. The monetary amount of the bond (defined as a bulk sum, a percentage of the contract remuneration, *etc.*) is generally calibrated to provide sufficient disincentives for delays, while avoiding excessively high levels that might represent barriers to entry for some players. For instance, they help to avoid situations where the premium charged by the guarantor company deters the participation of prudent bidders, as in the case of Germany (see Box 6.8).

BOX 6.8: COMPLETION BOND REQUIREMENTS: THE CASE OF GERMANY

In Germany's auctions during 2015-2017, the projects awarded have to pay a completion bond to the regulatory agency, Bundesnetzagentur, within 10 working days after having won in the auction. The bond is worth 57 USD/kW¹, or 28 USD/kW if the building permit is in place. Moreover, the bidders need to complete and commission the project within two years or they will lose their right to remuneration for the electricity produced.

³ An exchange rate of 1.13 USD/EUR was used, compatible with the exchange rate in end 2014-early 2015

Source: (Bloomberg New Energy Finance, 2015).

Another alternative would be to introduce surety bonds, which involve a third party that protects the electricity buyer against losses resulting from the project developer's failure to meet the obligation. In this case, the auctioning process awards along with the PPA (which hedges risks to the project developer) a surety bond that hedges risks to the electricity buyer, using a financial entity ("guarantor") as intermediary. In this case, the auctioneer has to differentiate the bids of project developers according to independent evaluations by the guarantor. This evaluation can be seen as roughly equivalent to one more step in the screening and qualification process, since guarantors will require different premiums from project developers with different reputations, according to the likelihood of them defaulting on their obligations.

A common practice is to partially execute the completion bond in case of delays related to specified intermediary milestones in the plant's implementation schedule. This makes it possible to closely monitor the evolution of construction and to provide early financial incentives to the auction winner. If surety bonds are employed, it is typical for the guarantor to automatically require reimbursement from the project developer in case of any partial execution of the bond. This procedure of restoring the obligation in case of partial execution can also be used in cases where other types of completion bonds are used, for instance by obliging the developer to restore security deposits. Upon completion of the project, the restored amount is then returned to the project developer – but the financial losses due to its execution will already have happened.

Delay-specific penalties

The choice of how the project developer's contractual obligations are treated (see Section 6.4) during the period of a plant's delay may result in incentives for more-timely implementation. Delay-specific penalties generally involve imposing fines and other monetary penalties applied just in case of delays. They can take different forms, acting as an adaptive mechanism, with increasing penalties as delays are longer, to milder treatments, with the contract end date postponed to preserve the total contract duration, for instance. Delay penalties can also take the form of an underperformance penalty, considering that the plant delivered 100% less energy than stipulated in the contract, as is the case of Brazil (see Box 6.9).

Besides monetary penalties, they also may involve disincentives of a non-monetary nature, such as preclusion from participating in subsequent auctions in the same jurisdiction.

Penalties for delays are normally listed in the contract awarded from the auction, or are clearly registered in regulatory instruments to which the contract makes explicit reference. Aspects related to the amount of the penalties and their application in case of delays with respect to intermediary milestones in the implementation schedule are similar to those presented for completion bonds.

One lesson learned from early auction implementations has been the challenge associated with having unclear provisions with regard to the contract schedule, not having defined delay penalties, and not requesting completion bonds (see Box 6.9 on experiences in the UK and France).

BOX 6.9: DELAY PENALTIES: THE CASE OF FRANCE AND THE UK

France

Due to the lack of strict requirements for auction participation and to the lack of penalties for underbuilding, the rate of projects constructed following the EOLE 2005 auctions was very low (five years after the auctions, only 10% of the generation contracted was actually produced). Therefore, the main difference between the EOLE 2005 and later auctioning programmes in France lies in the introduction of specific and strict requirements for participation as well as sanctions for delays in constructing the plant. The penalties took the form of either a shortening in the length of the contractual period, a suspension of the licence to operate for a period of time or a financial fee.

UK

Because the UK government did not set penalties for non-performance in the NFFO auctions that took place in the 1990s, project developers were not held responsible for not implementing their plans. In addition, because price was the only selection criteria, developers were incentivised to submit very low bids given the high level of competition of the auction, thus decreasing their chances of making a profit. This, combined with the loose qualification requirements for auction participation, resulted in a fairly low share of the contracted capacity being built after the NFFO rounds. Many of the winning projects had great difficulties in getting planning permissions from the local government and were therefore never built.

Sources: (Del Río, Linares, 2014), (Cozzi, 2012), (Wiser, 2002).

More-recent auctions have defined specific penalties against project underbuilding, as was the case in Brazil where bidders have to deposit several guarantees, including bid and completion bonds. Penalties for delays and underbuilding also apply. However, delay penalties (and completion bonds) have not always been effective in reducing delays in project implementation, especially when external factors interfere in the construction process, as shown by the experience in Brazil (see Box 6.10) and Peru (see Box 6.11).

BOX 6.10: DELAY PENALTIES: THE CASE OF BRAZIL

After signing the PPA, project developers in Brazil are required to deposit a completion bond of 5% of the estimated investment cost of the awarded project. Penalties for delays take the form of underperformance penalties, with 100% less delivered energy (see Box 6.8). If the delays exceed one year, ANEEL has the right to terminate the contract and to keep the financial guarantee.

However, no penalty enforcement has been applied so far, as delays have not been the fault of the project developer but were related to delays in obtaining environmental licences or grid expansion. Table 6.7 summarises the situation of delays with wind projects selected in both renewable energy and new energy auctions in 2009 and 2010

Table 6.7: Overview of wind project delays: The case of Brazil (as of September 2014)

Wind auctions	Reserve Energy Auction 2009	Reserve Energy Auction 2010 and Renewable Energy Auction 2010	Reserve Energy Auction 2011 and A-3 2011
Operation start date as stated in the contract	July 2012	September 2013 & January 2013	July 2014 & March 2014
Number of projects	71	70	78
Number of projects in operation	64	13	6
Number of delayed projects	7	57	72
Percentage of delayed projects (of the total)	10%	81%	92%
Number of delayed projects because of the transmission connection (capacity)	0	20 (257 MW)	23 (263 MW)
Percentage of delayed projects because of the transmission connection	0%	35%	32%

Sources: (Danish Energy Agency, 2009), (Ecofys, 2013), (Elizondo-Azuela, Barroso et al., 2014), (Maurer, Barroso, 2011).

Contract resolution clauses

Finally, contract resolution clauses specify that the contract awarded will be terminated in case of delays above a certain threshold. Contract termination is generally a last-resort measure, since it usually results in the project not being built at all – either due to the loss of the financial asset (the contract) upon which the bidder based the financial feasibility of the project, or even due to the loss of the

BOX 6.11: DELAY PENALTIES: THE CASE OF PERU

Peru has used strict delay penalties. After signing the contract, project developers are required to commit to a completion bond of \$100 000 per MW of capacity installed, and they must submit a progress report on the project's evolution every three months. If delays in the contracted timeline for construction occur for two consecutive quarters, penalties are deducted from the deposited guarantee.

If there are delays with the start of commercial operation of the plant, the bond is increased by 20% over the outstanding amount from the date of verification. The project developer may request to postpone the date of commercial operation provided that it is within a defined deadline and no longer than three months. If the accumulated delay exceeds one year from the date specified in the bid, the postponing might be accepted, and an increase in the performance bond by 50% takes place. Peru has implemented these stringent delay penalties in response to the urgency of operating projects to meet the country's rapidly growing energy demand and economic development needs.

Yet despite these stringent compliance rules, Peru has had mixed success in getting projects to start operation on time. Out of the 27 projects awarded in the first auction (selected in 2010 and scheduled to start operation in December 2012), only 19 are operating. Of the remaining eight projects, one was cancelled following payment of the completion bond, one suffered a force majeure incident (flood) and the other six have been delayed for different reasons, such as environmental permitting delays and problems in reaching agreements with local communities.

concession or permit to develop the project, in case this is inexorably associated with the contract.

The early identification of situations in which contract resolution is ultimately required is usually desirable. This can enable swift initiation of any arrangements – such as replacement auctions – needed to substitute the renewable energy capacity that corresponds to the terminated contracts and to meet any policy goals that otherwise may not be fulfilled. Conditioning contract termination to severe delays in meeting intermediary milestones in the contractual schedule is a possible mechanism for this early identification. Typically, resolution of the contract does not relieve the parties of any obligations or costs incurred until the date of the early termination (see Box 6.12).

Main findings

Reducing the likelihood of delays depends on the interaction of various design elements (ranging from the definition of contractual lead times to the definition of qualification requirements) as well as of mechanisms that do not necessarily have to

BOX 6.12: DELAY PENALTIES: THE CASE OF DENMARK

The auction was designed to guarantee the installation of 400 MW within 20 months after the winner was announced. Bidders were incentivised to offer the lowest possible price as this was the only selection criteria. As such, strict penalties and non-compliance rules had to be applied to guarantee compliance with the schedule.

Delay time	Penalty
Up to five months	DKK 10 (USD 1.78) per MWh (around 1% reduction of the remuneration)
Between five and nine months	DKK 20 (USD 3.56) per MWh (around 2% reduction of the remuneration)
Up to one year	DKK 30 (USD 5.34) per MWh (around 3% reduction of the remuneration)
More than one year	DKK 400 million (around USD 71 million)

Note: At an exchange rate of 5.6 DKK/USD.

If the winner chooses not to install the plant at all, the following fees apply:

Time to decide	Penalty
Up to five months from winning the contract	DKK 100 million (around USD 17.75 million)
Between six and twelve months	DKK 200 million (around USD 35.5 million)
More than one year	DKK 400 million (around USD 71 million)
More than one year	DKK 400 million (around USD 71 million)

If the winner of the bid opts out within the first six months, the second winner has to take over the contract and undertake the project within the same time frame, having an increased risk of running into penalties due to time pressure.

This risk, combined with the high penalties for delays and a very strict time plan, resulted in low interest in the Anholt tender and a low competition level. A key lesson from this experience is that while penalties can help to ensure project implementation, overly harsh limitations (steep penalties and strict time plans) can hamper competition.

be treated as auction design elements, such as the design of administrative procedures for licensing and permitting. As a consequence, explicit provisions introducing delays and underbuilding penalties are only one additional element that may influence the auction's outcomes – and the different implementations in various RE auctions can be classified as involving more or less severe penalties.

A summary comparison of the strictness of the options for delay and underbuilding penalties are presented in Table 6.8.

Table 6.8: Summary comparison of delay or underbuilding penalty options

Options Criteria	Delay and underbuilding penalties	
	More stringent penalties	More lenient penalties
Reduced uncertainties to investors	 Generators may be penalized for random, uncontrollable events	 Much smaller chance of generators being unfairly penalized
Avoided undercontracting	 Contracts may be cancelled more often	 May be slower in identifying “hopeless” projects and procuring substitutes
Projects completion	 Generators will do their best to comply with their commitment	 May induce generators to be more careful before assuming the commitment

Characteristics of the relevant attribute:  Poor  Medium  Very good

6.7 ASSIGNED LIABILITIES FOR TRANSMISSION DELAYS

Delays in the delivery of the product contracted in the auction can be caused either by delays in power plant construction or by delays in transmission grid expansion, as in the case of Brazil. The possible outcomes of allowing generators whose grid access is conditioned to grid expansion to participate in auctions (see Section 4.4) depend on yet another design choice: the allocation of the liabilities for not delivering energy or capacity when the required grid expansion is not completed on time. The alternatives available for policy makers are to: 1) *assign the liabilities to the project developer* or 2) *assign the liabilities to another agent*, usually an entity responsible for expanding the grid (the transmission system operator, the central planning agency or other agents, depending on the regulatory framework of the jurisdiction).

Liabilities assigned to the project developer

If the generator is made liable for failure to meet contractual obligations due to delays in implementing the required grid expansions, the resulting perception of risks can greatly impact the bids in the auction. This is not necessarily an inefficient outcome, since projects with a higher risk of not delivering the contracted products on time due to transmission constraints would require a higher risk premium and may be displaced by competitors.

There are many ways in which generators can participate in the implementation of transmission projects, after which the operation of new transmission facilities

is transferred to local network operators under regulated payments. In this case, the risk of high financial losses serves as a strong incentive for timely expansion of the grid. However, the extent to which generators are able to influence the implementation of network facilities is limited in many jurisdictions, and placing the liability entirely on them may result in significant risk premiums in auctions or even in low participation.

Liabilities assigned to another agent

If the liability is placed entirely on an agent other than the project developer, the risk of delays in implementing grid expansion is not internalised in the bids. Although this has the potential of reducing the risk premium required by participants, and thus reducing prices, the extent to which it produces desired outcomes depends on which agent assumes the liabilities

An obvious choice is to allocate the risk to the agent responsible for implementing the transmission and distribution network expansion, since this would result in incentives for the timely completion of construction. This can be the preferred choice in jurisdictions where the total revenues of this agent are significant in comparison to the possible monetary volumes of liquidated damages due to non-delivery of energy of renewable generators unable to feed in their generation – for instance, in European countries where a single, sizeable transmission company has a monopoly over transmission in large territorial areas.

However, in cases where transmission companies are comparatively smaller – e.g., in jurisdictions where their scope is limited to concessions involving a small set of facilities awarded as a result of competitive auctions, the possible monetary volume of the liquidated damages can even exceed the total revenues of the transmission agent. This would lead to a high perception of risk by the transmission agent responsible for implementing the transmission facilities and would raise the costs of this activity to unreasonable levels. In this latter case, the risk may end up being transferred to some extent to electricity consumers, who have limited possibilities of influencing the process of implementing network reinforcements.

A possible way of avoiding this undesired allocation of risks is to use other mechanisms to avoid or greatly reduce the possibility of delays in grid expansion. This may require the combination of a proper choice of auction design elements and the adjustment of the electricity regulatory framework that may not relate exclusively to auctions. For instance, if auctions are implemented without sufficiently large lead times for the delivery of products, the probability of delays due to network expansion increases (see Box 6.13). Alternatively, the approach of only contracting projects whose output can be transmitted without expansion of the electricity grid can be adopted, but with incentives for planning authorities to pre-develop the grid

in order to avoid unreasonable constraints to the capacity that can be contracted in each substation. The latter approach naturally leads to other key questions, such as how to allocate and recover the costs of the pre-developed network infrastructure.

BOX 6.13: TRANSMISSION RELATED DELAYS: THE CASE OF BRAZIL

The auctions for renewable energy projects in Brazil are held three or five years before the date of delivery of the auctioned product. In practice, however, the lead times have been shorter than this, with many auctions held after the middle of a year, and delivery being required for January of the target delivery year. This box focuses on auctions held three years before the delivery date.

In Brazil, market competition in generation auctions co-exists with centralised, determinative transmission planning. Centralised transmission planning for integrating generation projects that win auctions was traditionally carried out in a reactive fashion. After the auction winners were revealed and their location and nature was defined, three years before the contractual delivery date, transmission was planned, auctioned and built. For some time, this three-year interval was reasonably sufficient to implement the transmission facilities, and this arrangement worked fairly well.

This temporal co-ordination has been failing more recently. In practice, the auctions have been held two years and a couple of months before the delivery date. Environmental constraints have been a frequent cause of delays in the implementation schedule of transmission facilities, and some delays have been thought to relate to underbidding in transmission auctions (after central planning, concessions for the exploration of transmission concessions, including implementation activities). As a result, there have been many cases in which generation facilities are ready to operate by the time their contractual delivery date is achieved, but the output of renewable generators cannot reach the market because transmission capacity reinforcements are not ready in time.

In some of Brazil's early auctions, including those with the participation of renewable generators, the risk of such constraints to the provision of generation was allocated almost entirely to energy buyers. The long-term contract awarded as a result of the auction contained a waiver for the obligations of the project developer in case it could not fulfil these obligations due to delays in the commissioning of transmission. Generators were paid as if their contractual obligations were being met, and buyers had to arrange alternative procurement options. Penalties due to commissioning delays were applied to transmission companies, but these were not nearly commensurable with the losses incurred by the buyer. Due to the scale of the transmission concessionaires in Brazil, as a consequence of the model with competition for transmission concessions, penalties commensurable with the losses incurred by the buyer are not feasible in practice.

Box 6.14 describes the evolution of grid access policies in renewable energy auctions in Brazil, illustrating the interdependencies of defining the qualification requirements related to grid access permits and the sellers' liabilities.

BOX 6.14: EVOLUTION OF GRID ACCESS POLICIES IN BRAZIL

Brazil experimented with some alternatives for dealing with this problem. One involved an auction in which the maximum generation capacity to be contracted at any given transmission substation was limited by the capacity that could actually be drained by the transmission network (*i.e.*, without the need for any further transmission expansion). This limiting draining capacity was calculated by the Independent System Operator (ISO), and the information was made public before the auction. Although there was no evidence of abuse of market power due to this situation, determining the draining capacity at each substation proved to be a technically complex task, subject to some discretionary power by the ISO. This was because the evaluation required an integrated analysis of the network, and some data required for this analysis were difficult to acquire, as the winning projects of other nearby substations were not known.

Another attempt to deal with this problem involved fully allocating the risks of the unavailability of transmission capacity to the seller, without any changes to planning procedures by the Energy Planning Agency. The previous waiver for the generators, in case they could not fulfil the contractual obligations due to transmission delays, was removed. The generators were left with the task of estimating what would be the actual capacity by the time of their delivery date achieved, and made their bids in the auction at their own risk.

Having perceived this situation as undesirable, the Energy Planning Agency is in the process of implementing a novel pro-active planning procedure. Instead of planning transmission only after the auction winners are known, the agency seeks to plan in advance of auctions, based on technical information on the availability of wind resources – hence, predicting attractive areas. This enables the tendering of these transmission facilities before generation auctions. Generators still bear the risks of complying with contractual obligations if transmission is delayed, yet they have comparatively more certainty about the reinforcements to the transmission network that will be online at the contractual date of delivery.

As can be seen, the process results in some interference of the central Energy Planning Agency with competitive generation expansion, as the risks of projects in some areas, and not others, are reduced. The results of this novel approach are yet to be seen.

Source: (Rudnick, Barroso, Llaens, Watts, Ferreira, 2012).

Although the grid access dimension of an auction design was discussed (see Section 4.4), there are relevant interdependencies with the sellers' liabilities.

Main Findings

The issue of coordinating the expansion of the transmission grid with the contracting of new generation projects cannot always be ignored in RE auctions. Section 4.4 has addressed how grid connection ought to be taken into account as a qualification requirement for the auction, showing that in certain circumstances it is possible to sidestep the issue of liabilities in grid connection entirely. However, in certain RE auctions the winning projects rely on additional construction works to evacuate their generation – which requires a specific provision for the allocation of responsibilities. The main argument against allocating this responsibility to the project developer of the RE generation plant is that the agent becomes co-responsible for the actions of a completely separate entity (responsible for building the necessary transmission reinforcements). This forces the project developer to include a risk premium in its valuation, while at the same time sending an ineffective price signal to prevent delays.

A summary comparison of the alternatives for assigning liabilities for transmission delays is presented in Table 6.9.

Table 6.9: Summary comparison of transmission delay liability options

Options	Liabilities assigned to the project developer	Liabilities assigned to another agent
Criteria		
Guidance from the auctioneer (on most suitable projects sites)	 Developers prioritise the development of projects in sites with no risk in access to the network	 Developers do not have incentives to select projects with best siting
Level of Participation	 Some bidders may not be willing to bear this risk	 No risk for project developers
Reduced uncertainties to investors	 Bidders include this liability as a risk premium in their bids	 No associated risk premium
Avoided risks of delays	 Less potential since the project developer is not responsible for the expansion	 Great potential if the liable agents are the ones responsible for implementing network expansion
		



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