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International trends in spectrum auctions Implications for the Americas

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A new generation of auction formats are changing the balance of risks that bidders face when participating in spectrum awards. Formats such as the "Incentive Auction" in the United States and the Combinatorial Clock Auction (CCA) in Canada will allow bidders, to varying degrees, to pursue packages of frequency lots, thereby eliminating the risk that bidders are left stranded with unwanted lots. In Europe, where these formats have been pioneered for sales of spectrum suitable for new cellular technologies such as LTE, the designs were adopted on the promise of increased efficiency and incentives for more straightforward bidding. While the jury is still out on whether this promise has been fulfilled, bidders have discovered significant new challenges, including a difficulty in adapting traditional governance models to the CCA format and the risk of bidders paying wildly different amounts for similar spectrum portfolios.

A new wave of spectrum auctions

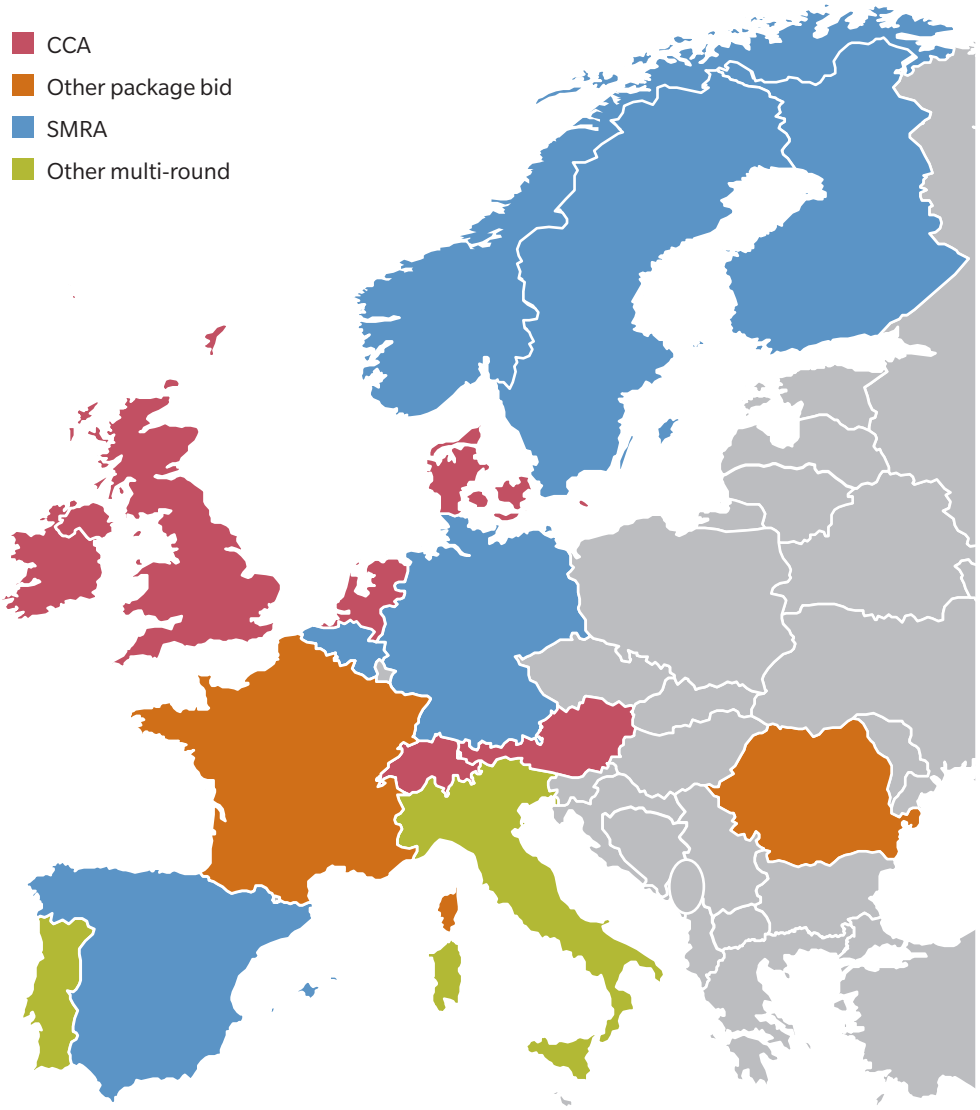
Over the next three years, there will be a series of high-value spectrum awards across the Americas. These include:

- Canada 700 & 2500 MHz, both awards scheduled for 2013, using the combinatorial clock auction (CCA) format.
- United States 600MHz, scheduled for 2014, will pioneer an "Incentive Auction" structure, using package bids to elicit buy offers from cellular operators and sell offers from broadcasters.
- 700MHz and other bands across Latin America and the Caribbean.

Historically, the United States has led the way both in determining the cellular band plans that are used across the Americas, and in pioneering auction formats for spectrum awards. Notably, the US Federal Communications Commission (FCC) pioneered the widely imitated simultaneous multiple round auction (SMRA). However, the United States has not had a major spectrum auction since 2007, when it auctioned the 700MHz band using a variation on the SMRA that permitted limited package bidding.

Since then, there have been two major developments in spectrum auctions that originated elsewhere. Firstly, while the SMRA is still in use, some European countries have introduced new formats that make extensive use of package bidding. In these auctions, bidders are permitted to make multiple, mutually exclusive bids for "packages" of lots, which they win or lose in their entirety. The most widely used format is the CCA, a multi-round auction adopted by eight countries so far. However, other variations exist, including the single round sealed bid package auction, used in France, and a first price package clock format, used in Romania.

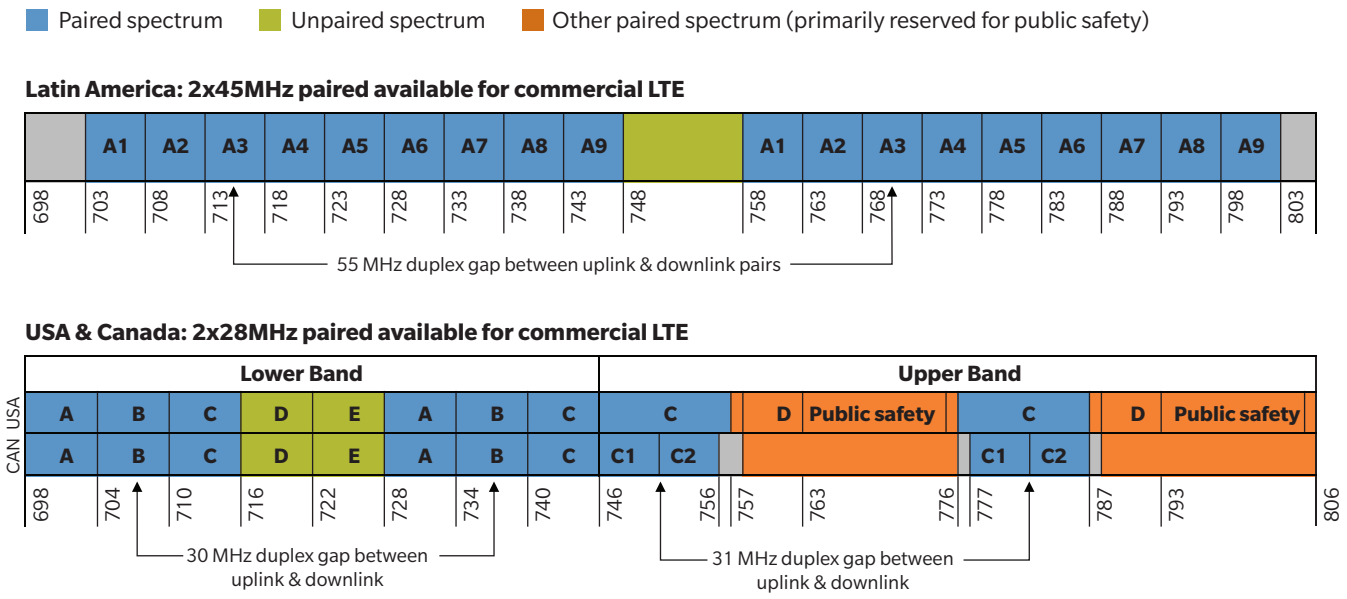
Figure 1. **Recent auction formats used for European LTE spectrum awards**



Secondly, a number of Asia-Pacific countries have reached consensus on a band plan for 700MHz that releases much more spectrum to the market than is possible under the US approach. Inspired by the economies of scale possible from a linkage to the Asia Pacific region, a number of Latin American countries, most recently Mexico, have announced that they too will adopt this plan, breaking their historic linkage to the FCC. Canada, however, will follow the US plan.

Looking forward, there will be great scope for both regional regulators and cellular operators to draw lessons from the European and Asian experiences. For US and Canadian operators, the outcomes of European auctions may provide insight into the risks and opportunities associated with package bidding. Meanwhile, across Latin America, attention may be directed towards Australia, which will be the first country to award 700MHz spectrum under the expanded band plan, and will do so in a combined award with 2500MHz under the CCA format.

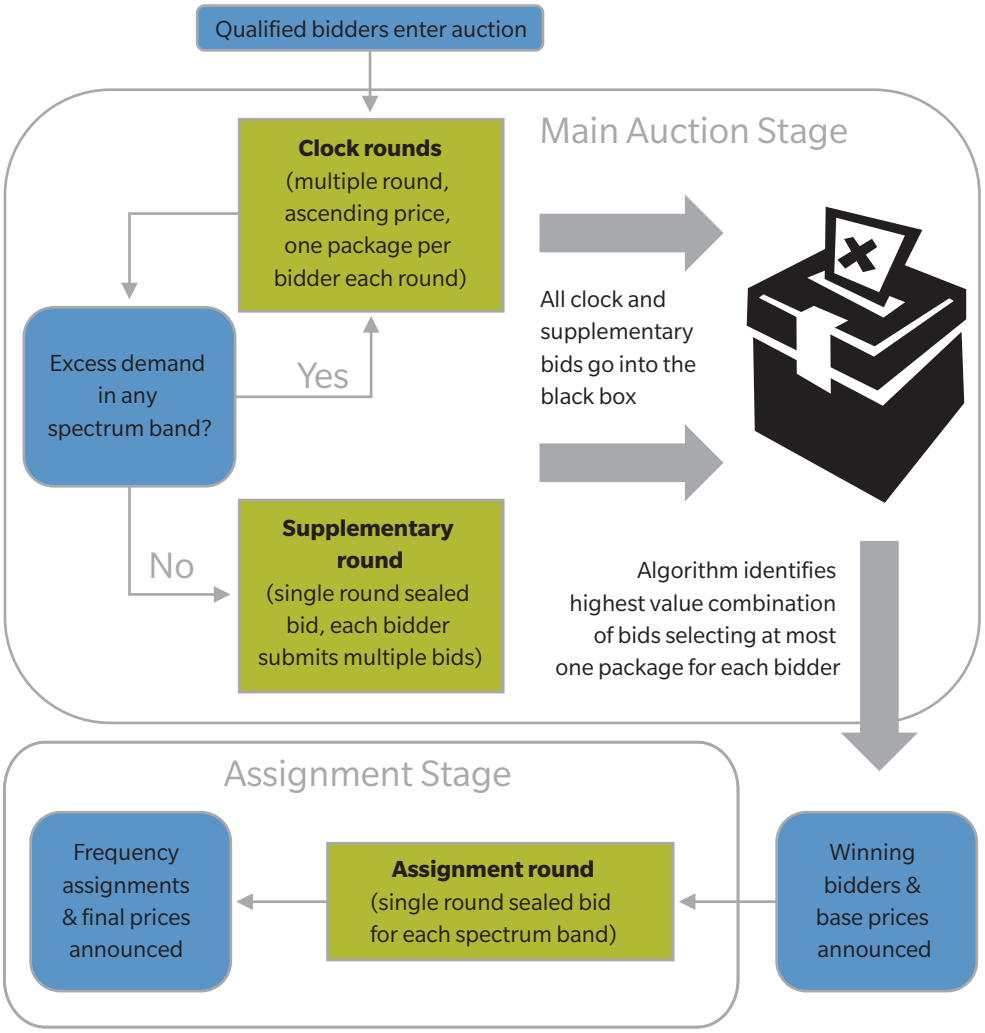
Figure 2. **The Asia Pacific / Latin America 700MHz band plan will release more paired spectrum than the FCC plan**



Can package auctions improve efficiency?

Both the CCA and the sealed bid package auction rely on an algorithm to identify the winning bidders. If all bidders submitted their valuations for every conceivable package, the algorithm would always identify the efficient outcome. In practice, the algorithm uses only the offers received to identify the highest value combination of bids that can be accommodated with the available spectrum. This outcome is only as good as the quality of bids going into the "black box". If the set of bids received is partial or there are bids that do not reflect valuations, then the outcome may be skewed.

Figure 3. **Overview of CCA auction format**



There are a number of reasons why the set of bids received may not be adequate to identify an efficient outcome; for instance:

- Competition concerns. Auctions rely on using bids as a proxy for the ability of companies to make most efficient use of spectrum in the downstream market. Typically, this is the best proxy available, but it's not always perfect. Notably, outcomes could be distorted if bidders anticipate that buying more spectrum could reduce competitive pressure and increase future profits. To prevent such outcomes, regulators sometimes intervene in package auctions, just like in other auction formats, to set spectrum caps and other constraints on permissible bids.

- Spectrum caps and other constraints. Policies such as spectrum caps, set asides, and restrictions on package choice may be used by regulators to promote particular policy goals, such as multi-operator outcomes and new entry. The common feature across all these measures is that they restrict the range of bids that can be made by some or all bidders. While this might have the effect of closing off some undesirable auction outcomes, if incorrectly applied, they could also close off the efficient market outcome.

- Strategy and tactics. One reason to introduce package auctions is that there are strong incentives for bidders to bid their valuations. However, regulators that worried about incentives in the SMRA for bidders to deviate from straightforward bidding for tactical reasons, for example to hide demand for some blocks until late in the auction, may have been too quick to embrace the package auction alternative as a way of eliminating such behaviour. Experience from Europe thus far appears to suggest that although package auctions may change the set of tactical tools available, strategy remains as important as ever.

Under suitable conditions, package auctions may increase the likelihood of an efficient outcome. However, package auctions are no panacea. Regulators and bidders still face a familiar list of concerns, such as the impact of auction outcomes on downstream competition, and incentives for bidders to deviate from straightforward behaviour, especially under low competition conditions.

New challenges for bidders in package auctions

Experience from Europe with the CCA highlights three major issues related to bid strategy and internal governance processes that bidders must grapple with:

Budget constraints

The CCA is designed to elicit bids based on valuations. Unlike an SMRA, winning bidders do not pay the amount of their winning bid; instead, they pay a "second price" based on the value of bids from other bidders that would be the next in line to win. In theory, this approach creates good incentives for bidders to bid their valuation, as they know that if they win they will only have to pay as much as is necessary to beat their rivals. Put differently, theory suggests you can bid without concern for competitor behaviour. In practice, financial constraints, which have intensified in the current economic climate in Europe, may mean that bidders can only bid a

fraction of their valuations. This is especially true for major LTE bands, such as 700MHz and 800MHz, where valuations for a mobile operator may be a large proportion of enterprise value.

Bidders that cannot bid at valuation face complex strategic decisions on how to trim their bids for different packages, which requires an understanding of what they might win, which in turn requires good competitor analysis. If bidders make the wrong decisions, they risk winning too little spectrum, and this may undermine the efficiency of the auction outcome.

Payment uncertainty

With the CCA, prices—like outcomes—are determined in the black box. Often, it is impossible for a bidder to predict exactly what they will pay, as their price depends on bid amounts submitted by rivals and bidders only have access to aggregate information about their rivals' bids (unlike some past SMRAs, where full information about bids was released each round). Further, such bids may be increased in the sealed bid "supplementary round" that is the culmination of the multi-round CCA. At best, with sophisticated tracking techniques, it is possible to estimate a range of payments and put some probability on particular outcomes based on knowledge of the rules and competitor intelligence. This range may be quite wide.

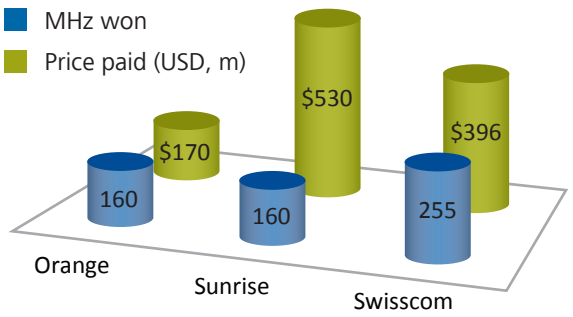
Payment uncertainty poses great challenges to traditional governance systems for spectrum auctions, which are based on sign-off of a budget limit. How do you set a bid limit relative to budget if payments could (but may not) be significantly lower than bid price? Should you increase the bid limit beyond budget and risk over-paying, or set them together, and risk not winning a preferred package at an affordable price? There are no easy answers to these questions.

Uneven prices and predatory bidding

The 2012 Swiss auction highlighted the scope for bidders in a CCA to pay very different prices for similar spectrum portfolios. In that auction, illustrated in the chart below, one bidder (Orange) secured 160MHz at the reserve price of SFr.155 m, while another (Sunrise) paid SFr.482m for the same quantity of spectrum. While full bids were never published, it may be inferred from the results that Orange and (the other bidder) Swisscom made much more creative use of bids that set prices for their rivals than did Sunrise. The Swiss outcome also generated debate in the trade press as to whether there is evidence that the CCA is vulnerable to so-called "predatory pricing", where bidders submit bids that they do not expect to win with the primary intention of driving up prices for rivals.

Around the time of the Swiss auction, Ofcom (UK), ACMA (Australia), and Industry Canada were each developing their own CCA with novel activity rules that provide increased certainty for bidders about the price they would need to bid in the supplementary round to secure specific packages. These rules were announced with

Figure 4. **Swiss multi-band auction result**



much fanfare. However, regulators may be having second thoughts.

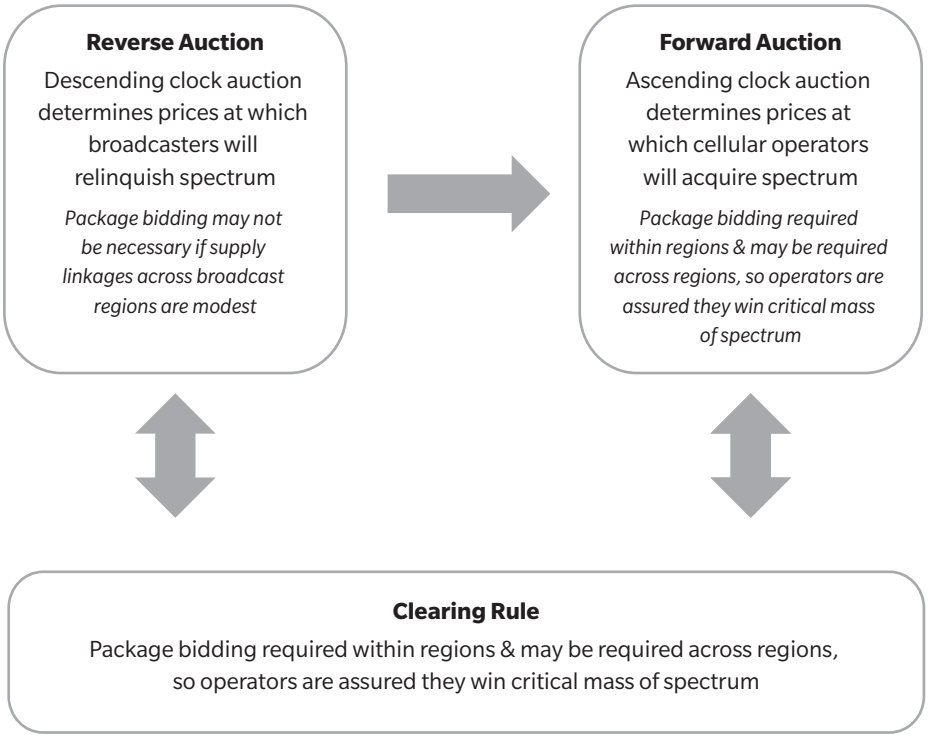
In July, Ofcom scrapped most of its new rules, reverting back to a format similar to that used in Switzerland. It cited a desire by bidders for a less complex process as a motivation for the change. In August, the ACMA unexpectedly launched a consultation on a menu of alternative CCA activity rules (some of which look like the Swiss rules), which are designed to address concerns about "strategic and predatory bidding behaviour" under its original rules. In this context, it is perhaps not surprising that Industry Canada is yet to announce its decision on the 700MHz auction, following a consultation process on the rules that started in April.

The fact that CCA rules are now reverting back towards the Swiss format, where predatory bidding concerns were first raised, suggests that this will remain an area of concern for many future auctions.

The US Incentive Auction

Insights from Europe may be particularly valuable in the context of the US Incentive Auction, which will again be pushing the boundaries of auction design. The success of this process requires the FCC to run two auction processes, linked together by a clearing rule that determines what spectrum is reconfigured for cellular use. The hard part is aligning incentives for both buyers and sellers to bid their valuations, while also giving cellular operators sufficient certainty over what they are buying.

Figure 5. **How the FCC Incentive Auction might work**



A "straw man" proposal for the auction format is described in a paper by Paul Milgrom et al., commissioned and published by the FCC, and released as this article was being drafted. The central idea is for a sequence of clock auctions, which will provide a single price for buying and selling frequency blocks in each area. (The buy and sell prices will not actually be the same, as a margin between them is required to provide revenues for the federal government).

One of the most striking features of the latest proposals is the omission of a significant role for package bidding. Leaning largely on existing clock auction formats to equilibrate a two-sided market is an ambitious endeavour. It may be that for a particular region, there is no single price at which demand and supply would be in balance. Further, if cellular operators cannot bid on packages across regions, they may not be able to express the value of the synergies that likely exist from acquiring a critical mass of geographic coverage.

Another area of uncertainty that the current proposals do not adequately address is the extent to which bidder valuations may depend on the final band plan. The economic viability of any particular frequency band depends more on the anticipated availability of handsets supporting the band than the intrinsic qualities of the spectrum. If the auction were effective in clearing a large expanse of spectrum nationwide that supported multiple operators, it could supplant 700MHz as the more important low frequency band in North America. Indeed, it could set the way for the eventual creation of a global 600MHz band. However, a smaller plan with uneven clearance across the United States might offer only limited value and would likely be ignored outside North America.

Cellular operators now face an interesting dilemma. Should they respond positively to the current, relatively simple design proposals, and live with the uncertainty over the outcome? Or should they demand changes, such as the use of package bids perhaps contingent on particular band plans, that give them more certainty over outcome but may raise other concerns, such as those associated with the CCA?

From Europe to the Americas

Over the next two years, attention on spectrum auctions will shift from Europe, whose latest wave of LTE auctions are approaching conclusion, to the Americas. New band plans and auction formats promise great benefits for operators and their consumers, but also create new challenges.

Regulators face the challenge of devising auction mechanisms that create good incentives for straightforward bidding by participants, given local policy priorities and demand conditions. Package auctions are one possible approach. However, while they originally may have seemed poised to supplant other auction formats altogether, recent challenges may mean that there is no consensus on a best approach. Auction rules for package auctions are likely to continue evolving for some time to come.

For bidders, learning from the experiences of European operators may be a first step to achieving a good auction outcome at home. Knowledge of these processes may facilitate effective responses to government consultations on spectrum awards, and provide insights into bid strategy that confer a competitive advantage in a complex auction setting.

NERA's role in guiding regulators and bidders

NERA's global auctions practice is at the forefront of developments in spectrum auction design and bidding strategies. Our team has advised governments and bidders in dozens of spectrum auctions around the world.

Our skill set includes:

- Expert experience with designing and implementing all auction formats
- Exceptional track record in developing bid strategies that help our clients secure their spectrum targets at low prices relative to competitors
- Valuation of LTE spectrum portfolios
- Online bidding software for running or simulating all auction formats
- Visualization tools for tracking bids, monitoring payment exposure, and identifying optimal bids

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About the authors

Dr. Chantale LaCasse is a Senior Vice President in NERA's auctions practice and is based in Washington, DC. Chantale has over 20 years' professional experience related to auctions and competition matters across a variety of sectors. She has provided conceptual advice to regulators and industry clients on the design of auctions and she has developed detailed rules for their implementation. Her work includes the design and management of auctions in several jurisdictions in the United States, and in other countries including Canada, Spain, Singapore, and Ireland. She previously held the TD MacDonald Chair at the Competition Bureau in Canada.

Richard Marsden is a Vice President in NERA's auctions practice and is based in New York City. Richard specialises in spectrum policy and auctions. Over the last 14 years, he has advised bidders or governments in more than 45 spectrum auctions in the Americas, Asia, Africa, and Europe. He was a key member of the design team that pioneered the use of package auctions, including the CCA, for the UK, Dutch, and Danish spectrum regulators. Recently, he has focused in particular on developing and executing bid strategies for bidders in LTE spectrum auctions, both with and without package bidding.

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