Comments on Guangdong electricity market draft policy documents

September 2018[1]

Executive Summary

Guangdong's proposed electricity market rules represent an important step forward. We believe that, over time, the documents will help move Guangdong and the China Southern Grid (CSG) region toward a more efficient, lower-emissions, lower-cost, and more reliable power system. We offer the following observations about the proposed rules and recommendations for modifying them, based on our understanding of China's power sector and our experience in the United States, Europe, and other parts of the world.

- **Market Oversight**
  - We are concerned about the Market Management Committee's role, including in establishing "reference prices," given our understanding that the committee is composed largely of market participants.
  - Consider establishing *independent* market monitoring units (that is, units whose membership does not include anyone that has a financial interest in the market), responsible for establishing the "reference prices" for each generation unit and evaluating market power. Following U.S. experience, it would also be useful to give these market monitoring units responsibility for publishing detailed quarterly reports about market conditions, and for recommending changes to rules to improve market performance.
- **Generator Compensation**
  - Be cautious about giving generators capacity payments ("compensation for fixed costs").
  - If capacity payments are implemented, this should be done strictly: only generators that are economic, meet environmental standards, and are actually needed for reliability or flexibility services should receive a capacity payment. To this end, any capacity payments should be linked to detailed and improved planning and approval processes.

[1] Max Dupuy is the lead author of this paper and is responsible for any errors or omissions. Yue Lijun, Fredrich Kahrl, Kevin Porter, Ryan Wiser, and Frederick Weston provided input and comments.

- **Development of a China Southern Grid (CSG) Regional Market**
  - We recommend giving priority to this task, as lack of regional integration is at the heart of challenges with integration of CSG's hydro capacity into system operations—and will be important for integrating the region's growing amounts of wind and solar capacity as well.
  - We suggest implementing similar market rules and operations software systems across the CSG region, to facilitate market unification in coming years.
- **"Medium/Long-Term" Contracting**: The emphasis on contracts for differences (CfDs) in documents is an important and positive step, and we recommend maintaining this emphasis in the final draft.
- **Participation of Distributed Energy Resources**: We recommend developing more detailed rules to recognize, reveal, and reward the capabilities and services that demand response, storage technologies, and other distributed energy resources can provide.

Introduction

The Southern China Energy Regulatory Office of the National Energy Administration, the Guangdong Provincial Economic and Information Technology Commission, and the Guangdong Provincial Development and Reform Commission recently issued a series of documents on "Electricity Spot Markets in the Southern Region (Starting in Guangdong)". We congratulate the authorities on moving ahead with the development of electricity markets in the region.

Here we will offer comments on the proposed market rules. These comments are only our initial reactions to the proposed rules and we are very selective in the topics we address. We hope to provide further input on additional topics at a later date. We focus here on the document titled *Basic Rules for the Operation of Guangdong Power Market (Consultation draft)* (广东电力市场运营基本规则(征求意见稿)), although we also address points raised in some of the other documents. We organize our comments in reference to key topics that we have stressed in earlier writings about Guangdong and China's broader power sector reform effort. Our comments are based on our understanding of developments in Guangdong and other parts in China, as well as our experience with market design and power sector policy in the United States, Europe, and other parts of the world.

Overall, we view the Guangdong documents as a promising step forward. We believe that, over time, the documents will help move Guangdong and the China Southern Grid (CSG) region toward a more efficient, lower-emissions, lower-cost, and more reliable power system—and also help lead the way for corresponding efforts in other parts of China. Of course, implementation will be challenging. There is no need to get all of the details right at the outset—indeed, the documents envisage many challenges being addressed after 2020—but it will be crucial to identify which details are important and which can wait.

'Getting market design right' has proven to be an ongoing challenge in other countries as well. Parts of the world that first embarked on market reform in the 1990s have been through numerous rounds of revisions to their market designs and market rules, and continue to have

vigorous debates, particularly given that the challenges of renewables integration and decarbonization were not high-priority policy concerns when the markets were first implemented. It is clear that decisionmakers in Guangdong have closely observed the experience in other countries, and we hope our comments, based on international experience, will be useful for further refining the Guangdong market design. In what follows, we emphasize areas where Guangdong's proposed market design might be improved—and where it might ideally "leapfrog" the other markets in addressing important goals such as integration of variable renewable generation and emissions reduction.

Background

In a recent paper, we drew on international experience with electricity markets. Ideally, electricity markets should be designed to achieve the following fundamental objectives:[2]

1. **Guide efficient system operations.** All market models are concerned with ensuring efficient use, on a day-by-day and hour-by-hour basis, of available generation resources (and, increasingly, also demand-side resources) in a least-cost manner. This includes economic dispatch, under which the power sector dispatcher, on an hour-by-hour basis, chooses the resources with the lowest operational cost (and ideally also the lowest emissions), whenever possible.
2. **Guide rational investment and retirement of generators and other resources.** Markets should send price signals to help stimulate investments in the "right" resources (that is, the most cost-effective resources available to support policy objectives for reliability and emissions reduction). Similarly, markets should send signals to rationally retire excess and unneeded capacity, including dirty and inefficient power plants that are not in line with policy objectives. In recent years, much discussion has been focused on how to ensure investment in distributed and non-generation resources, such as storage and demand-side management, can be considered on a "level playing field" with traditional power plants.
3. **Provide rational compensation for generation owners (and, again, for non-generation resources).** This supports the first two objectives by giving generators adequate incentives to operate efficiently and flexibly—and also to invest in and retire facilities in a rational way.

We also stressed that markets are tools and should be designed to meet government policy objectives, including goals for efficiency, emissions reductions, and reliability. When markets are not delivering outcomes in line with policy objectives, it is necessary to modify the market rules and regulations. In addition, we emphasized that markets cannot meet these goals alone, and that they need to be closely coordinated with various planning processes—including planning processes for transmission and demand-side resources.

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[2] NRDC,RAP. (2017). *Electricity Wholesale Markets: US Experience and Recommendations for China*. Retrieved from https://www.raponline.org/knowledge-center/electricity-wholesale-markets-us-experience-and-recommendations-for-china/

We now turn to specific recommendations regarding the Guangdong proposals, framing our comments with regard to those three very broad principles.

Market Oversight

It is good to see that Guangdong's proposed rules recognize the importance of market monitoring and market power mitigation. This is likely to be very important, given the high concentration of generation ownership in Guangdong. We offer the following observations and suggestions:

- We believe that the approach set out in the proposed rules has good characteristics, including use of "reference prices" for each generation unit (typically known as "reference levels" in the U.S. context). However, we think the approach will need to be strengthened. For example, it would be best to have clearer procedures for developing "reference levels" in policy documents.
- We are concerned about the Market Management Committee's role, given our understanding that the committee will be composed largely of market participants. In the United States, independent system operators and regional transmission organizations (similar organizations referred to throughout this brief as ISO/RTO),[3] which are broadly analogous to Guangdong's proposed spot market, independent market monitors have been very important in promoting transparency, reporting on the overall functioning of the markets, and executing tests for market power, including developing the crucial reference price levels.[4] The proposed rules in Guangdong would give much of this authority—including developing reference levels—to the committee and thus largely to market participants themselves. These market participants will unavoidably be conflicted between their own private interests and ensuring the proper functioning of the market. We recommend that Guangdong should give these responsibilities to an independent market monitor organization or a government agency.

  The market monitoring units play very important roles in the ISO/RTOs in the U.S.:

  - Monitoring of compliance with rules
  - Evaluating market performance and issuing recommendations for rule changes and reforms, detailed in periodic reports.

[3] For more discussion of US ISO/RT markets, see NRDC,RAP. (2018). *Electricity Wholesale Markets: US Experience and Recommendations for China*. Retrieved from https://www.raponline.org/knowledge-center/electricity-wholesale-markets-us-experience-and-recommendations-for-china/

[4] For example PJM's detailed manual on "Cost Development Guidelines" is available here: http://www.pjm.com/~/media/documents/manuals/m15.ashx and ERCOT's "Verifiable Cost Manual" is available here: http://www.ercot.com/mktrules/guides/vcm

  - In each U.S. ISO/RTO, the market monitor also issues very detailed quarterly and annual reports.[5] These are important in helping promote transparency and understanding of market conditions.
  - Market monitors also have some authority (varying by region) to directly impose penalties on market participants for market manipulation—and they can raise issues directly with the Federal Energy Regulatory Commission.
- If no market monitoring units are created in Guangdong, we again recommend giving these responsibilities to the appropriate government agency.
- Policy documents should clearly link the concept of reference price levels to generation unit operational costs, where operational costs include opportunity costs and also ideally include the social costs of emissions.[6] We note that Guangdong has developed a framework for collecting information on the operating costs of generators. There should be a clear link to this effort in the market policy documents.

Given the high levels of ownership concentration in Guangdong, we would expect that a robust market power mitigation procedure will end up regularly adjusting many bids, in line with reference levels. In effect, this outcome would be similar to a 'cost-based' market design.[7]

Generator Compensation

Rationalizing generator compensation has long been an issue of concern in Guangdong and China more broadly.[8] Traditionally, generator capacity cost ("fixed cost") recovery was based on how many hours each generator operates at an administered "on-grid" per kWh price. Accordingly, there has been a strong incentive for generators to oppose reductions in operating hours that might accompany dispatch reforms.

Broadly speaking, the challenge is to design an approach to generation compensation that 1) supports dispatch reforms; 2) compensates generators that are needed for reliability; 3)

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[5] One example is PJM, an RTO that serves all or parts of 13 states and the District of Columbia.PJM has an outside market monitor, Monitoring Analytics, prepare both quarterly and annual markt status reports. See http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2018.shtml

[6] FERC. (2014). *Staff Analysis of Shortage Pricing in RTO and ISO markets*. Retrieved from https://www.ferc.gov/legal/staff-reports/2014/AD14-14-pricing-rto-iso-markets.pdf

[7] For discussion of the concept of a 'cost based' market design, and its relationship to market power mitigation, see "Recommendation 1" on page 3 of Dupuy et al. (2017). *Power Consumption, Demand and Competition Cooperation: Recommendations for the Pilots in Guangdong, Jilin, Jiangsu, and Shanghai*, available in English and Chinese at https://china.lbl.gov/news/article/power-demand-report

[8] For example, see discussion of generator compensation in Kahrl et al. (2016). *Issues in China Power Sector Reform: Generator Dispatch*. Retrieved from https://www.raponline.org/wp-content/uploads/2016/07/rap-kahrl-dupuy-wang-china-generator-dispatch-reform-july-2016.pdf.Dupuy et al. (2015). *Low-Carbon Power Sector Regulation: Options for China*. Retrieved from http://www.raponline.org/wp-content/uploads/2016/05/rap-worldbank-lowcarbonpoweroptionsforchina.pdf (Chinese Executive Summary only available at https://www.raponline.org/blog/low-carbon-power-sector-regulation-options-for-china_cn/) and RAP. (2013). *Recommendations for Power Sector Policy in China*. Retrieved from https://www.raponline.org/knowledge-center/recommendations-for-power-sector-policy-in-china-practical-solutions-for-energy-climate-and-air-quality/ (Also available Chinese at https://www.raponline.org/knowledge-center/recommendations-for-power-sector-policy-in-china-practical-solutions-for-energy-climate-and-air-quality_cn/)

encourages those generators that are not needed to shut down; and 4) sends the right signals for new investment in flexible resources. The proposed markets in Guangdong could meet these four criteria. However, much depends on the details of implementation.

The main documents dated August 31, issued by the Southern China Energy Regulatory Office of the National Energy Administration, the Guangdong Provincial Economic and Information Technology Commission, and the Guangdong Provincial Development and Reform Commission, do not appear to directly address fixed costs.[9] On first reading, we took this to mean that the proposed spot market is envisaged as an "energy only" market—i.e., one without capacity payments (In an energy only market, compensation for generator capacity costs typically depend strongly on a limited number of hours of the year when the per kWh price on the spot market reach its highest levels.). However, a document issued solely by the Guangdong Economic and Information Commission (EIC) dated September 3, 2018, says that generation units will be compensated annually for fixed costs.[10] It appears this applies only to thermal units and may be paid in a RMB/kW format, but it is not entirely clear from the document.

This leads us to several recommendations:

- The issue of generator capacity payments should be addressed in a clear and detailed manner in the main market rules.
- Any capacity payments should be paid on a RMB/kW of available capacity basis, not RMB/kWh. (The September 3rd EIC document is not entirely clear on this issue.)
- Unfortunately, although the current round of five-year planning for the electricity sector represents some improvement, there is still much to be done in terms of developing a rational planning process that identifies a least-cost mix of resources with the right characteristics, such as flexibility.[11] In addition, investment approval still appears to be insufficiently tied to any planning process at the provincial or national level. Investments in new generation resources seem to be sometimes made without reference to whether the resource is actually needed for resource adequacy.

Overall, capacity payments have been highly controversial in the United States and Europe—and, in practice, have often supported high-emitting and inflexible resources in a manner that raises costs for consumers and society.

Turning from the issue of capacity payments, we note that the proposed rules include measures limiting spot market price fluctuations. Price caps are common in the U.S. and European markets—although these have also attracted much criticism and have in many cases been loosened in order to reduce incentive distortions. In particular, limiting spot market price

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[9] The documents mention in passing that "a capacity market may be developed after 2020".

[10] See Appendix 1, Article 19 of "广东省经济和信息化委关于征求广东电力现货市场机组发电成本测算办法及两个规范文件（稿）意见的函", available here: http://www.gdei.gov.cn/ywfl/dlny/201809/t20180903_130326.htm

[11] RAP, NRDC. (2017). *Power Sector Planning: US Experience and Recommendations for China*. Retrieved from https://www.raponline.org/knowledge-center/power-sector-planning-us-experience-and-recommendations-for-china/ and Dupuy and Xuan. (2016). *Excess Coal Generation Capacity and Renewables Curtailment in China: Getting With the Plan*. Retrieved from https://www.raponline.org/blog/excess-coal-generation-capacity-and-renewables-curtailment-in-china-getting-with-the-plan/ (Also available in Chinese at: https://www.raponline.org/blog/excess-coal-generation-capacity-and-renewables-curtailment-in-china-getting-with-the-plan_cn)

spikes can dampen the incentive for efficient investment in, and operation of, flexible resources. Strong and independent market monitoring and mitigation—as discussed in the previous section—is generally a better approach to dealing with market power than limiting prices.

Development of a Southern Grid Regional Market

Official policy statements call for a CSG market to be developed. We recommend giving priority to this task, as lack of regional integration is at the heart of challenges with integration of CSG's hydro capacity—and will be important for integrating the region's growing amounts of wind and solar capacity.[12] We recommend thinking ahead in the development of markets in the other CSG provinces—for example, implementing similar market rules and operations software systems across the CSG region, to facilitate market unification in the coming years. Ideally, the CSG market will be developed as a single integrated market with a CSG-wide footprint, rather than as separate markets with "inter-provincial trade" or other inter-provincial linking mechanisms.

Medium/Long-Term Contracting

The current approach to medium/long-term (MLT) contracting now common in Guangdong and other provinces appears to represent a less-than-ideal compromise in the process of liberalizing the generator output plan and introduces a source of inflexibility in system operations. As we noted in an earlier paper, care needs to be taken to avoid an approach where dispatch is unnecessarily constrained by year-in-advance contracting decisions. Instead, the spot market should guide dispatch (subject to current reliability conditions and constraints) and MLT contracts should be the concern of generators and demand-side entities interested in hedging their exposure to short-term prices.[13]

In this regard, the emphasis on contracts for differences (CfDs) in Guangdong's new proposed regulation is an important and positive step, and we recommend maintaining this emphasis in the final draft. The replacement of the current MLT contracting model with CfDs will allow market participants to hedge risk, without burdening the dispatch centers with responsibility for dispatching according to MLT contracts.

Participation of Distributed Energy Resources

We note that Document 1 includes the following provisions regarding distributed energy resources (DERs), which we think are worth keeping:

- Article 20 calls for demand response resources to participate in ancillary services compensation mechanisms at a later date.

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[12] For more discussion, see RAP, NRDC. (2017). *Renewable Energy Integration: US Experience and Recommendations for China*. Retrieved from https://www.raponline.org/knowledge-center/renewable-energy-integration-us-experience-and-recommendations-for-china/ and Recommendation 5" on page 31 of this report: https://china.lbl.gov/news/article/power-demand-report.

[13] RAP, NRDC. (2017). *Electricity Wholesale Markets: US Experience and Recommendations for China*. Retrieved from https://www.raponline.org/knowledge-center/electricity-wholesale-markets-us-experience-and-recommendations-for-china/

- Article 64 calls for the grid companies to, "Carry out demand-side management within the scope of the power grid under the jurisdiction in accordance with relevant regulations."
- Article 155 encourages the participation of storage resources in ancillary services compensation mechanisms.

However, the ancillary services markets will likely be small compared to spot energy trading. We suggest including provisions to allow the participation of DERs in the energy markets as well (and capacity markets, should they be developed). We also recommend creating detailed market rules that recognize the varied characteristics and capabilities of each type of DER, such as storage with fast charging and discharging capabilities.[14] We also note that Article 152 is somewhat confusing in that it appears to designate demand response a type of ancillary service itself. It would be better to allow DERs to provide services—and be compensated on a basis similar to supply-side resources—in line with their capabilities.

Congestion Risk Management

Nodal pricing is a good step forward (assuming, of course, that the markets are well-implemented and prices are near competitive levels). Nodal prices reveal congestion costs and locational values in a more transparent way. This should help drive more rational locational investment decisions (by both generation and load) and also help with grid planning and related issues. Given nodal pricing, it will be necessary to have a strategy for dealing with the intersection between contracts and congestion costs. We support the idea of developing financial transmission rights to allow the market participants to hedge the risks associated with congestion.

[14] For more discussion, see Dupuy and Porter (2018). *Leveling the Playing Field for Storage Resources in China's Electricity Markets: A View from the U.S.* Retrieved from https://www.raponline.org/blog/leveling-the-playing-field-for-storage-resources-in-chinas-electricity-markets-a-view-from-the-u-s/