

# Comments on National Energy Administration’s “Advancing Electricity Spot Market Implementation”

March 2019<sup>1</sup>

## Introduction

The National Energy Administration’s (NEA) recent document represents an important step forward with spot market implementation and design. We provide comments on the document, based on our knowledge of China’s situation and international experience.

'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 officials at NEA have closely observed the experience in other countries. Our comments are aimed at providing suggestions on further refining the market design blueprint.

At the outset, it is worth briefly revisiting an overarching question: why implement spot markets? In any country, electricity markets should be designed to achieve the following fundamental objectives:<sup>2</sup>

- **Identify variable costs of each resource:** Help reveal the variable (operating) costs of each resource (that is, each generator, storage unit, distributed energy resource (DER), etc.)—information which can then be used to operate (dispatch) the grid in an economic manner that

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<sup>1</sup> Max Dupuy is the lead author of this paper and is responsible for any errors or omissions. Yue Lijun, Fredrich Kahrl, David Moskovitz, and Ryan Wisser provided input and comments.

<sup>2</sup> For an overview of these issues from an international perspective, see *A Toolkit of Global Insights as China Builds Its Power Sector of the Future*. Retrieved from: <https://www.raponline.org/blog/toolkit-global-insights-china-builds-power-sector-future/>

minimizes costs and emissions.

- **Provide operational incentives:** Provide rational compensation for owners of generation and other resources, in a way that gives them adequate incentives to operate efficiently and flexibly.
- **Guide investment and retirement:** Help guide rational investment in needed generation capacity and other resources and retirement of resources that are *not* needed.

We suggest that it would be valuable to include a statement of these three basic objectives in the NEA document. Our comments here center on evaluating whether the NEA document is in line with these three objectives.

## Regional Markets

We strongly agree with NEA that implementation of “beneficial regional markets” (Article 4) is an important principle. Establishing unified and integrated spot market footprints that cover multiple provinces will be important for integrating growing amounts of wind and solar generation, help with integrating and maximizing the value of hydro generation, and help lower capital and operating costs.<sup>3</sup>

In other parts of the world, including the European Union and parts of the United States, policymakers have been working to create electricity markets with broad geographic footprints, in order to take advantage of efficiencies (in particular, less capacity is needed to serve load, and that capacity can be operated more efficiently) and to take advantage of the way in which the variability of wind and solar generation tends to even out over larger geographic areas.<sup>4</sup>

In the case of China, it would be easier to work toward establishment of this type of broad regional market right from the beginning. This could avoid some of the long and complex work at a later date, such as the ongoing effort in the European Union to “harmonize” various national markets into a unified

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<sup>3</sup>For more discussion, see RAP and NRDC. (2017). *Renewable Energy Integration: US Experience and Recommendations for China*. Retrieved from <https://www.raonline.org/knowledge-center/renewable-energy-integration-us-experience-and-recommendations-for-china/> and Recommendation 5 on page 31 of Dupuy et al. (2017). *Power Consumption, Demand and Competition Cooperation: Recommendations for the Pilots in Guangdong, Jilin, Jiangsu, and Shanghai*. Retrieved from <https://china.lbl.gov/news/article/power-demand-report>.

<sup>4</sup> For example, see Linvill. C. (2014). *Power Sector Leaders Act to Save Western Electricity Consumers Money*. Retrieved from <https://www.raonline.org/blog/power-sector-leaders-act-to-save-western-electricity-consumers-money/>.

continent-wide market, difficulties in coordinating among regional transmission organizations (RTO) and independent system operators (ISO) markets in the Midwestern and Eastern United States, and ongoing efforts in the western United States to develop new regional markets.

We recommend encouraging groups of neighboring provinces to design a single integrated market, or at least to develop compatible designs so that the provincial spot markets can be more easily integrated later. For example, the Southern Grid spot market pilot calls for a spot market to be implemented first in Guangdong, with a regional market to be implemented later. Instead, the Southern Grid regional market could be designed as a regional market right from the outset. Such integration will help reduce system costs and emissions, improve reliability, and foster clean energy integration.

## **Competition, Variable Costs, and Dispatch**

It is our understanding that, in many parts of China, the spot markets may initially be characterized by provincial (as opposed to regional) markets in which generation ownership is fairly concentrated. In addition, there may be pockets of recurrent grid congestion in some provinces, and there will be a limited fraction of generation capacity participating in the market (with the rest—including a substantial amount of remaining “planned” generation—acting as “price takers”). Given that electricity markets can be particularly susceptible to manipulation by market participants, particularly under these conditions, we recommend strengthening regulation to ensure that markets are not manipulated and produce efficient outcomes. We suggest that the current NEA document should provide more guidance on this subject.

Our concern here is partly to avoid inefficiencies that arise when generators are intermittently able to raise prices above competitive levels and extract monopoly rents—but also (perhaps most importantly) by concern about whether the market will be able to play its key roles of guiding dispatch and sending signals for investment and retirement. Spot markets will only do an adequate job of revealing the variable costs of generators if the markets are well-designed and if there is sufficient competition. A manipulated market, a thin market, or a market that is dominated by firms that may have other objectives or motives may require special considerations.

In fact, markets in the United States and other parts of the world are closely monitored and individual generator bids (offers) are closely scrutinized according to transparent procedures—and can be revised (mitigated) by market overseers to rational levels, if these procedures detect deviations from competitive levels. In some cases, a generator is pre-determined to be facing inadequate competition and its offers are essentially required to be based on an estimated “reference level”.

For China, we suggest considering a practical initial market design with “cost-based dispatch”. That is, a design based on estimated generator variable costs. Under this approach, variable cost data (including emissions costs and opportunity costs) for each generation unit are collected, subject to verification. The dispatch organization and market organization then use these estimates to establish a merit order and set a market-clearing price for the spot market.<sup>5</sup> At minimum, it may be worth designating a province to pilot this approach.

Even if this “cost-based” approach is not taken, we recommend that the document include additional language on collection of generator variable cost data—as well as additional language on market monitoring and the mitigation or adjustment of generator bids.<sup>6</sup> In particular, we recommend specifying that each regional and provincial spot market must:

- Put in place authority and procedures for variable cost data collection. The Guangdong Department of Information and Technology policy of September 2018 is a useful reference point.
- Develop “reference prices” (“reference levels” in the U.S. parlance) for each generation unit, linked to reported and verified variable costs.
- Establish a robust market power mitigation procedure specifying when and how generator bids are to be adjusted.
- Establish independent market monitoring units (that is, units whose membership does not include anyone that has a financial interest in the

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<sup>5</sup> For more discussion, see Recommendation 1 of Dupuy et al. (2017). *Power Consumption, Demand and Competition Cooperation: Recommendations for the Pilots in Guangdong, Jilin, Jiangsu, and Shanghai*. Retrieved from: <https://china.lbl.gov/news/article/power-demand-report>.

<sup>6</sup> In parts of China that have concentrated ownership, high grid congestion, or are otherwise susceptible to insufficient competition, 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.

market), responsible for establishing or evaluating 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.

Again, we believe it is worth stating in the NEA document a fundamental objective of any spot market: to help reveal the variable (operating) costs of generators and other resources—information which can then be used to operate (dispatch) the grid in an economic manner that minimizes costs and emissions.

## Medium-Long-Term Contracting

We believe that the emphasis in the NEA document on transforming medium-long-term contracting to financial contracts—specifically, NEA uses the term “contracts for differences” (CfDs) —is very good. We recommend protecting a central role for financial contracts in the final version.

However, we are skeptical about the remaining role for physical contracts outlined in the document. Care needs to be taken to avoid any approach where dispatch is unnecessarily constrained by year-in-advance or month-in-advance contracting decisions. Of course, the most accurate information on weather, demand, and other grid conditions is not available so far in advance. This can lower system efficiency, raise system costs, hamper much-needed flexibility and act as a barrier to integration of wind and solar generation.

Instead, the spot market should guide dispatch (subject to current reliability conditions and grid constraints). Medium-long-term (MLT) contracts should be financial in nature and should be left to generators and demand-side entities interested in hedging their exposure to spot market prices.<sup>7</sup> In this way, an MLT contracting model based on financial CfDs can allow market participants to hedge risk, without creating the inefficiencies and inflexibility created by burdening the dispatch centers with responsibility for dispatching according to MLT contracts decided far in advance.

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<sup>7</sup> 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>

## Generator Compensation

Rationalizing generator compensation in China has been a longstanding issue and power sector reform effort launched in 2015 (with Document 9) has been heavily concerned with this topic.<sup>8</sup> Traditionally (before Document 9), 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 traditionally been a strong incentive for generators to oppose the reductions in operating hours that dispatch reforms would imply (for at least some generators).

Broadly speaking, the challenge for implementation of Document 9 has been to design an approach to generation compensation that 1) supports dispatch reforms; 2) compensates generators that are needed for reliability; 3) encourages those generators that are not needed to shut down; and 4) sends the right signals for new investment in flexible resources. Our reading of the current NEA document suggests that NEA envisions an “energy-only” market. In an energy-only market, there are no capacity payments, and 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.

Overall, capacity payments have been highly controversial in the United States and Europe—and have arguably, in some cases, supported high-emitting and inflexible resources in a manner that raises costs for consumers and society. If capacity payments are to be included, we suggest clarity and caution about the design of these payments. 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. We also recommend improving planning and

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<sup>8</sup> For example, see discussion of generator compensation in Kahrl et al. (2016). *Issues in China Power Sector Reform: Generator Dispatch*. Retrieved from <https://www.raonline.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.raonline.org/wp-content/uploads/2016/05/rap-worldbank-lowcarbonpoweroptionsforchina.pdf> (Chinese Executive Summary only available at [https://www.raonline.org/blog/low-carbon-power-sector-regulation-options-for-china\\_cn/](https://www.raonline.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.raonline.org/knowledge-center/recommendations-for-power-sector-policy-in-china-practical-solutions-for-energy-climate-and-air-quality/> (Also available in Chinese at [https://www.raonline.org/knowledge-center/recommendations-for-power-sector-policy-in-china-practical-solutions-for-energy-climate-and-air-quality\\_cn/](https://www.raonline.org/knowledge-center/recommendations-for-power-sector-policy-in-china-practical-solutions-for-energy-climate-and-air-quality_cn/))

approval processes to guide any capacity payment.<sup>9</sup>

The NEA document includes language about limiting spot market price fluctuations. Limiting spot market price spikes can dampen the incentive for efficient investment in, and operation of, flexible resources. Price caps are common in the U.S. and European markets—although these have in many cases been loosened in order to reduce incentive distortions. Strong and independent market monitoring and mitigation is generally a better approach to dealing with market power than limiting prices.

## Renewable Energy Participation

The NEA document envisions variable renewable energy (VRE) participating as a “price taker” and continuing to be subject to “priority dispatch”. This is a reasonable approach, at the beginning. However, we encourage eventually moving to a model in which VRE directly participates in these markets: VRE would bid into energy markets based on variable costs (which should be near-zero in the case of wind, solar, and run-of-river hydro capacity), and also be allowed to participate in markets and compensation mechanisms for the ancillary services that it is able to provide.

## Creating a Level Playing Field for all Resources, including storage and DERs

We recommend that the markets should be designed, from the start, to provide a level playing field for all technologies according to their capabilities. In other words, the markets should not be designed with just the technical capabilities of coal plants in mind. Instead, any resource that is able to provide a service (including energy or any ancillary service) should have the opportunity to participate and be compensated accordingly. This should include distributed energy resources, grid-scale storage, solar plus storage plants, and variable renewable energy.<sup>10</sup>

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<sup>9</sup> See RAP and NRDC. (2017). *Power Sector Planning: US Experience and Recommendations for China*. Retrieved from <https://www.raonline.org/knowledge-center/power-sector-planning-us-experience-and-recommendations-for-china/> and Dupuy, M. and Wang, X. (2016). *Excess Coal Generation Capacity and Renewables Curtailment in China: Getting With the Plan*. Retrieved from <https://www.raonline.org/blog/excess-coal-generation-capacity-and-renewables-curtailment-in-china-getting-with-the-plan/> (Also available in Chinese at [https://www.raonline.org/blog/excess-coal-generation-capacity-and-renewables-curtailment-in-china-getting-with-the-plan\\_cn](https://www.raonline.org/blog/excess-coal-generation-capacity-and-renewables-curtailment-in-china-getting-with-the-plan_cn))

<sup>10</sup> For more discussion, see Dupuy, M. and Porter, K. (2018). *Leveling the Playing Field for Storage Resources in China's Electricity Markets: A View from the U.S.* Retrieved from <https://www.raonline.org/blog/leveling-the-playing-field-for-storage-resources-in-chinas-electricity-markets-a-view-from-the-u-s/>

## Other Issues and Concluding Thoughts

We recommend development and publication of timelines for development of spot markets and liberalization of the remaining generation covered by output planning (including milestones to be met on a provincial, regional, or national basis). This will be important for market participants who need to continue to make investment decisions during the years in which these new market structures are under development.

In other countries, it has been clear 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. Markets cannot meet these goals alone, and they need to be closely coordinated with various planning processes—including planning processes for transmission and demand-side resources.