BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION
UNITED STATES OF AMERICA

Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators	**Docket No. AD13-7-000**

COMMENTS OF
THE REGULATORY ASSISTANCE PROJECT

January 7, 2014

The Regulatory Assistance Project (hereinafter, "RAP") respectfully submits the following comments in respect of FERC Docket No. AD 13-7-000 ("Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators"). These comments are in response to the Commission's 25 October 2013 invitation to interested parties to respond to questions arising from the 25 September 2013 Technical Conference.

Introduction

RAP's views regarding the matters raised in the Commission's written questions remain essentially unchanged from those provided in the written opening statement provided by Michael Hogan, RAP Senior Advisor, as a prelude to Mr. Hogan's verbal testimony before the Commission at the 25 September 2013 Technical Conference on the referenced Docket. Indeed, we are pleased to note that the questions posed by the Commission in its 25 October invitation reflect in many cases the very issues highlighted by Mr. Hogan in both his written statement and in his verbal testimony. As such, we attach hereto Mr. Hogan's written statement for reference and we wish to reaffirm our support for the comments provided therein.

The questions raised by the Commission in its 25 October invitation, together with some of the testimony provided at the Technical Conference by various witnesses, suggest a need for added focus on the following issues:

1) The role of functionally differentiated compensation to capacity resources in accelerating the transformation of the existing resource portfolio by guiding divestment, a dimension of the centralized capacity market debate that is often overlooked in favor of the more familiar (though equally important) focus on shaping incremental new investment;
2) The tacit recognition in at least two of the Eastern RTO/ISOs of the appropriateness, indeed the imperative of differentiating capacity resources based on critical capabilities,

further eroding the already untenable claim that a centralized capacity market must be designed around a single undifferentiated capacity product; and

3) The need to re-examine the proper role for historical generation resource adequacy "standards" such as "one day in ten years," particularly in light of the implications of sustaining economically dubious requirements in a world with far higher shares of variable generation.

Our comments will focus on these three specific aspects of the questions posed by the Commission.

Investment vs. Divestment

Discussions about centralized capacity markets take place predominantly around questions about the viability of new investment in capacity resources. While this is undoubtedly the primary issue motivating the consideration of centralized capacity markets, there is a pressing need to examine the role that capacity markets play (or do not play) in guiding both the quantity and shape of divestment from existing capacity resources.

Electricity demand in recent years has been flat to declining in many areas, including the Eastern ISO/RTO regions, at a time when many of these regions already enjoyed healthy reserve margins. This is due both to the short-term effects of the recent recession and the longer-term effects of increasing energy efficiency and demand response. Where these trends combine in many states with ongoing investment in renewable generation (at both transmission and distribution levels), issues affecting new investment in capacity resources have been overshadowed by economic pressure on the continued commercial viability of many existing resources.[1] In these circumstances a pressing question for policy makers is how single-product capacity markets affect the commercial viability of various types of capacity in the existing resource fleet and, by extension, how they affect the pace and profile of capacity rationalization.

Many factors contribute to determining the commercial viability of existing assets, where investors' choices tend to be more constrained than when considering investment in new resources. Taking all such factors into account, are the existing assets that are under the most economic stress actually those that are the least valuable today and for the foreseeable future? Scanning competitive wholesale markets (both in the US and in Europe) the empirical evidence, while mixed, suggests that in fact the primary driver of actual and threatened capacity withdrawals is overwhelmingly whether or not a resource is (for the moment at least) winning the fuel-price lottery. Whether or not that is the "right answer" is an interesting question but not of immediate interest here. The question for this forum is whether or not single-product centralized capacity markets are helping or hindering the transition to an economically optimal capacity resource portfolio, particularly within the context of a low or zero net growth generation resource market.

[1] This is not unique to US reliability regions – similar conditions exist in much of Europe, where flat demand, excess production capacity and even more aggressive policy-driven addition of renewable production have created a rapidly changing commercial environment for existing capacity resources.

Based both on the evidence to date and on the fundamental design philosophy, the answer seems to be that they are unhelpful at best and very likely counterproductive. In ISO New England, reserve margins have been well above 20% for many years and the Forward Capacity Market has consistently cleared at or near the price floor, yet the System Operator is facing growing concerns about its ability to ensure adequate supply. The problem is not that there is not enough capacity – as the ISO has made quite clear, the problem is that certain types of resources are leaving the system, leaving a mix of resources that are still adequate in quantity but that, in many cases, are less operationally capable of responding to market conditions at critical times. In Germany, where there is substantial surplus capacity and which does not currently have a capacity market, the existing resources under the greatest economic duress are the newer, more flexible natural gas-fired plants, with older lignite-fired plants running round-the-clock almost regardless of market conditions. In both cases the overwhelming driver of who goes and who stays is the price of natural gas relative to other options – cheap in ISO New England, expensive in Germany. Other factors, such as operational flexibility, are in the background noise.

While this is a limited sample, it illustrates points that should be reasonably obvious. Where markets rely on the prices of energy and ancillary services to drive resource investment and divestment, important questions of operational capabilities are not yet affecting investment / divestment decisions to any significant degree even where operational flexibility is becoming a critical system reliability and cost factor.[2] Where single-product centralized capacity markets have been introduced they have thrown a lifeline indiscriminately to capacity resources without consideration for other equally important factors determining whether or not adequate supply is likely to be available at all times and at least cost. What falls through the cracks between the two is the value of investment – new or existing – in specific operational capabilities of critical value today and for the foreseeable future. We have made the point previously that this will become a crucial failing of existing capacity markets in the near future as variable production grows and new investment decisions are taken; that failing is already evident in emerging patterns of capacity rationalization.

Facts on the ground

Proponents of single-product capacity markets continue to maintain (as they did again in comments at the 25 September technical conference) that energy and ancillary services markets that (in their view) cannot accurately express the value of long-term investment in firm capacity will nonetheless accurately express the value of long-term investment in resource flexibility. This is an extraordinary claim, and extraordinary claims demand extraordinary evidence. Such evidence is not only lacking; as we discussed in the foregoing section, the available evidence – particularly from emerging patterns of divestment within existing capacity resource portfolios – strongly suggests otherwise.

[2] As discussed in Mr. Hogan's written statement, the shortcomings of current "energy only" markets can be and, in some markets are being addressed; what remains true, however, is that while they persist these shortcomings affect equally the investment case for capacity resources in general and for increased resource flexibility in particular.

Perhaps even more dispositive is the fact that RTO/ISOs themselves, despite publicly expressed skepticism about differential valuation of capacity in theory, are in practice doing just that in at least two noteworthy cases. ISO New England have proposed what is in effect a winter peak capacity product distinct from the broader firm capacity product (though it is not packaged explicitly as such),[3] while PJM have already implemented sequential auctioning of demand response capacity resources based on operational capabilities and have proposed further restricting the quantity of the least flexible of the three product categories.[4] Both implicitly acknowledge that all capacity resources are not of equal value in meeting resource adequacy requirements, and they do so in both cases in markets where variable renewables (and the associated increase in the value of resource flexibility) have yet to become a significant operational reality.

In the case of ISO New England, the immediate motive for their proposed Performance Incentive is to address the fact that they are increasingly reliant for resource adequacy on gas-fired generation that may not be able to secure natural gas deliveries during critical peak heating events. This is a specific problem, one of several looming reliability issues identified by ISO New England in their recent strategic review.[5] The proposed Performance Incentive is designed to address it specifically by reducing the capacity revenues paid to resources that fail to perform as promised during certain critical periods and transferring the foregone capacity revenues to those resources that do perform as promised.[6] A previous conceptual proposal, later withdrawn, would have been able to address a broader range of issues using sequential clearing auctions based on specified operational capabilities.[7] ISO New England have acknowledged that the current proposal is not designed to address whatever resource investment needs might arise once variable renewables become a more significant share of the New England market. It is therefore a piecemeal approach that will need to be revisited (probably more than once), but it nonetheless uses differential capacity compensation in an attempt to effect a change in the mix of resource capabilities that clear in the FCM auctions. Unfortunately the mix of capacity resources favored by the current proposal will not necessarily be any more flexible; they will only be more likely to be operating during critical winter peak periods.

---

[3] See *FCM Performance Incentives* (October 2012) at www.iso-ne.com/committees/comm_wkgrps/strategic_planning_discussion/materials/fcm_performance_white_paper.pdf

[4] http://www.pjm.com/~/media/documents/ferc/2013-filings/20131129-er14-504-000.ashx

[5] See *Roadmap for New England* (March 2012) at www.iso-ne.com/committees/comm_wkgrps/strategic_planning_discussion/materials/strategic_plan_initiative_roadmap_march_2012.pdf

[6] It remains puzzling why ISO New England continues to avoid the seemingly obvious option of fixing the design flaw that allows generators without firm access to fuel supplies to bid into the FCM as firm capacity on an unrestricted basis. Affording similar treatment to variable renewables would understandably meet with strenuous objections.

[7] See *Using Capacity Markets to Meet Strategic Challenges* (May 2012) at www.iso-ne.com/committees/comm_wkgrps/strategic_planning_discussion/materials/fcm_whitepaper_final_may_11_2012.pdf

In the case of PJM, they have already implemented a sequential clearing auction for demand response resources, defining three distinct DR products based on the differential system value of their operational capabilities. PJM have now proposed capping the quantity of the least valuable DR product (Limited DR) that can clear in the auction. In effect PJM have implemented – and are proposing to refine – a market-based version of exactly the measure suggested by Commissioner Snitchler of Ohio in his testimony before the Technical Conference, in which he suggested that payment for "demand response" (by which one could infer from his description he meant something like Limited DR) should be discounted to reflect the limitations on its usefulness to system operators as a reliability resource. What is noteworthy about both PJM's approach to demand response and Commissioner Snitchler's suggestion is that they conspicuously overlook the fact that similar issues arise with supply side resources. Commissioner Snitchler suggested that it would be irresponsible to become overly reliant on demand response that is only available 10 times a year for 6 hours at a time. Would it not be equally irresponsible to become overly reliant on 26% efficient simple cycle gas-fired turbines? Or highly inflexible must-run thermal plants? As variable renewable production grows on PJM's system the differentiation between the system values of different types of capacity investment (whether supply- or demand-side) will only increase. The principle that PJM already employs in its treatment of demand response capacity resources will apply to capacity resources more broadly as the gap grows between the legacy portfolio of resource capabilities and the portfolio of capabilities best suited to the future generation mix.

What constitutes "adequate"?

Finally, we note that the Commission's invitation alluded to "the current one day in ten year resource adequacy approach" without taking up the issue of whether or not "the current approach" continues to be the appropriate one. We respectfully suggest that this would be a missed opportunity to address an issue of real importance to the question of the economic efficiency of centralized capacity markets that rarely receives the attention it deserves. Such market interventions have often been justified on the basis of arguments from "the missing money problem," yet it is less than clear that the money that is claimed to be "missing" in many of these arguments is money that would be paid in a fully efficient and properly functioning wholesale electricity market. Rather the money claimed to be "missing" is, in many cases, payment for additional reliability insurance that may or may not represent value for money.

A substantive debate has been underway on this issue for some time now in ERCOT as part of the PUCT's ongoing Project 40000, and while ERCOT is not subject to FERC jurisdiction the debate offers relevant and especially instructive insights into the questions posed by FERC in the context of an active regulatory docket. Several analysis-rich submissions have been filed with the PUCT[8] in the course of Project 40000 that can help to inform an in-depth consideration

[8] Examples include The Brattle Group's Newell et al., *ERCOT Investment Incentives and Resource Adequacy* (1 June 2012), beginning at page 100; Charles River Associates' Plewes & Hieronymus, *Economic Impact of Inadequate Generation in ERCOT* (27 August 2013); and Wakeland, *Review and Analysis of Charles River Associates' "Economic Impact of Inadequate Generation in ERCOT* (22 November 2013).

of whether the current treatment of resource adequacy "standards" in FERC jurisdictional RTO/ISO regions is likely to lead the desired outcome.

These regulatory filings, and the body of research upon which they draw (one recent example being a July 2013 London Economics analysis[9] commissioned by the UK Government's Office of Gas & Electricity Markets and Department of Energy and Climate Change), lead us to recommend strongly that the Commission widen its focus to encompass not just the question of how most cost-effectively to deliver a reserve margin designed to meet an historical loss-of-load-expectation (LOLE) but to examine critically the costs and benefits of the presumptive LOLE itself.

At the risk of stating the obvious, the objective of a resource adequacy standard is not and cannot be that service would never be interrupted because of a shortage of available resources. The objective is rather to reduce the likelihood of such service interruptions to an acceptable level. While that may seem obvious it is often obscured in the public discussion, and it is worth repeating since it reminds us of why it is so important to then ask: a level acceptable to whom and why? As the ERCOT debate and related analyses from elsewhere have made clear, pat answers like "one day in ten years" (the historic and economic bases for which are somewhat nebulous to say the least) are no longer sufficient to guide policy and regulation in a system where markets and variable supply resources are becoming entrenched realities. No examination of centralized capacity markets can be considered complete without a critical examination of the following questions:

1) To the extent it can be determined theoretically, what is the real "value of lost load" – that is, what would businesses and consumers reliant on the grid pay in $/MWh to avoid involuntary service interruptions;
2) What level of service reliability is actually experienced by the vast majority of businesses and consumers, and to what extent is the current level of reliability considered "acceptable;"
3) What are the root causes and timing of service interruptions actually experienced by consumers, and to what extent are current resource adequacy standards actually contributing to service reliability standards;
4) What are the true costs, in $/MWh of load loss avoided, of various measures intended to reduce the likelihood of involuntary service interruptions due specifically to a shortage of available supply resources at a given moment; and
5) (To bring it back to the original question) are such costs justified based on the actual value of the load loss thus avoided?

We are not suggesting that this is the only basis upon which the Commission might evaluate the current approach to resource adequacy. Cost is only ever one of a number of public policy considerations that properly enter into such a deliberation. But where possible the discussion should be grounded in a fact-based consideration of costs and benefits. We acknowledge that until demand is able to participate fully in the electricity markets the true value of lost load for

[9] London Economics, *The Value of Lost Load (VoLL) for Electricity in Great Britain* (July 2013)

most electricity consumers will remain somewhat debatable. However the analyses cited here, *inter alia*, suggest that the true value of lost load for the vast majority of loads falls within a range that is orders of magnitude below the level implied by currently deployed resource adequacy standards.

As discussed in Mr. Hogan's September 2013 opening statement, we acknowledge that there may well be valid public policy reasons for seeking an additional margin for error in the quantity of resources secured on behalf of grid customers. In Germany, for instance, where a similarly lively debate is underway regarding capacity-based market interventions, the debate has tilted in the direction of a "strategic reserve" service designed to establish a reserve available only in the case of a truly extreme event (i.e., when the wholesale market fails to clear at a price at or below an administratively determined value of lost load) and that would operate in isolation from the competitive wholesale market. In any case, it is important that this be approached deliberately and that the market instruments intended to achieve it be designed to do so in an economically efficient manner. The current approach – to apply a fixed reserve margin as an across-the-board requirement derived from an economically debatable loss of load expectation – would seem (based on an examination of the available research) to be a costly solution, one that will become even more burdensome with an increasing share of variable renewable production on the system.

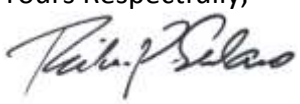
Conclusion

We reiterate our support for the commentary submitted by Mr. Hogan in his September 2013 opening statement (attached). Based on the questions posed by the Commission and on various testimony presented at the Technical Conference we have offered additional commentary here on three issues we believe are deserving of additional emphasis:

1) The importance of understanding the broader implications of experience to date with the role single-product capacity markets are playing (and should play) in the rationalization of capacity in fully supplied markets;
2) The applicability of actions taken by System Operators for the purpose of differentiating the value of capacity resources in resource adequacy-driven market interventions to all supply and demand side resources; and
3) The opportunity presented by the Commission's current process to re-examine the appropriateness of current resource adequacy standards and how they are shaping related wholesale market interventions.

We thank the Commission and Staff for the opportunity to comment on these important issues. We would be pleased to answer any questions you might have.

Yours Respectfully,



Richard Sedano
Principal, Director US Programs
Regulatory Assistance Project

Michael Hogan
Senior Advisor
Regulatory Assistance Project

Opening Statement
FERC Technical Conference on the Future of Centralized Capacity Markets
Docket No. AD13-7-000
Michael Hogan
Regulatory Assistance Project

Introduction

Two critical success factors in energy and services markets – particularly with more variable supply – are demand participation in the markets and accurate real-time shortage pricing. Until these are manifest intervention, usually in the form of price caps and capacity markets, may be desired to mitigate market power and deliver administratively set reliability outcomes. The same conditions driving the case for adopting capacity interventions also mean that flexible resources that could more efficiently provide the operational flexibility increasingly required in the resource mix may not be adequately compensated for doing so. Thus capacity markets must value not just capacity but the optimal mix of capabilities to ensure reliability at least cost.

With that as an introduction, the following are my responses to the questions posed to panelists:

1. What are the main challenges facing centralized capacity markets today or that can be anticipated going forward? Are the current centralized capacity market designs able to effectively manage those challenges? If not, what change in current design elements should be pursued going forward?

The US power system is evolving into one with large and growing shares of low-carbon supply. A large portion of that low-carbon supply will come from variable (or "intermittent") supply resources. The growing role for renewable supply in the power sector is justified based on a range of public policy objectives, including not only environmental concerns but also on public health, economic development and security of supply grounds. This will happen, perhaps more slowly in some markets than others, but it will happen. Markets that derive a significant share[1] of electricity supply from variable resources will see a dramatic increase in the value of resource flexibility,[2] value that in many, perhaps most cases is not adequately expressed in the way prices are currently formed in energy, ancillary services and (where they exist) capacity markets.

Some have argued that while there may be a rationale for adopting a discrete market-based intervention for firm capacity there is no comparable rationale for incorporating operational criteria into resource adequacy mechanisms like capacity markets and, furthermore, that doing so will somehow degrade the performance of capacity markets in ensuring least-cost resource adequacy. In fact, the very market design flaws giving rise to the conditions driving

[1] What is "significant" will vary based on a number of factors, including the size of the balancing area and the mix of primary resources, but experience to date suggests variable production beyond 10-15% of annual energy production constitutes a significant threshold.
[2] "Resource flexibility" here refers to conventional system services such as regulation, spinning and non-spinning reserves, as well as evolving services such as "fast-ramping" and frequent stop-start cycling capabilities.

the adoption of capacity markets are equally problematic for the proper valuation of investments in operational flexibility. Briefly, these include limitations on participation by demand in energy and services markets; flaws in the formation of pricing, particularly scarcity pricing in many current energy and ancillary services markets; and (closely related to these) political intervention in markets to cap prices in response to concerns about extreme volatility and abuse of market power. Each of these market design flaws directly affects the ability of *flexible* resources to be paid fully for the particular value they provide to the system; historically this may not have been a significant problem, but it will become increasingly problematic as (as noted for instance in NREL's 2012 *Renewable Energy Futures* study)[3] the role of flexible thermal resources shifts more to one of providing reserves and other system services and less one of producing energy. One can debate whether these issues can be resolved to the extent that administrative interventions like capacity markets are no longer required, but in the meantime – looking forward rather than backward – the case for adopting capacity markets will increasingly be only as strong as the case for differentiating the value of capacity resources (both supply- and demand-side) based on the operational capabilities they can provide to the system.

Indeed this reality is already in evidence in ISO New England, though at the moment it is driven not primarily by the growth in renewables but by growing dependence on natural gas plants and the particular variability in fuel supply and transportation arrangements on which they rely. (ISO New England has made it clear that they see similar challenges arising as the share of variable renewable supply grows on the system.) ISO New England has come forward with various proposals to address these concerns – all have in common that they would drive greater value to those resources participating in capacity markets that are capable of responding to changing system needs and less value to those that cannot.

As has been demonstrated by study after study (and as discussed at length in our papers *Beyond Capacity Markets* and *What Lies "Beyond Capacity Markets"?*),[4] the power system of the future is one in which the traditional approach to assessing "resource adequacy" in isolation from "system security" is no longer a least-cost approach. While reliability standards can be met via the more traditional approaches to resource planning that inform the design of current capacity markets, the costs and risks of ensuring reliability will be greatly reduced by ensuring that market designs properly value investments in the added operational flexibility that some resource options can provide.

2. In order to achieve resource adequacy goals, should centralized capacity markets be expected to meet specific reliability and operational system needs (i.e., accommodating new and emerging technologies such as variable energy resources, distributed resources, or demand-side resources)? If so, how should capacity markets be designed to procure resources with specific operational attributes and what should those attributes be?

As discussed in the answer to Question 1, centralized capacity markets in future will need to value different capacity resources differently depending on their ability (or lack thereof) to provide critical operational capabilities at least cost. In our paper *What Lies "Beyond Capacity Markets"?* we propose several different approaches, including (where a capacity

---

[3] National Renewable Energy Laboratory. (2012). *Renewable Electricity Futures Study*. Hand, M.M.; Baldwin, S.; DeMeo, E.; Reilly, J.M.; Mai, T.; Arent, D.; Porro, G.; Meshek, M.; Sandor, D. eds. 4 vols. NREL/TP-6A20-52409. Golden, CO: National Renewable Energy Laboratory. Retrieved from http://www.nrel.gov/analysis/re_futures/.

[4] Hogan, M. & Gottstein, M. (2012). *What Lies "Beyond Capacity Markets"?.* Montpelier, VT: Regulatory Assistance Project. Retrieved from www.raponline.org/document/download/id/6041

market already exists) apportioning the auctioning of capacity into sequential tranches where resources with specifically desired operational attributes are procured first, followed by subsequent tranches for less valuable capacity until the auction's limiting criteria have been reached. ISO New England proposed a similar approach in March 2012 (as did PJM in 2005), but they have since proposed a more direct, bonus-and-penalty-based administrative intervention into their Forward Capacity Market. We believe that a broad signal of investment preferences via sequential apportionment combined with improvements in the effectiveness of underlying energy and services market price formation would be a more efficient, more equitable and more sustainable approach. Elements of this approach might be seen in PJM's recent decisions to (i) adopt an operating reserve demand curve, (ii) include demand response bids in the formation of shortage pricing and (iii) trifurcate its demand response auction into sequential procurement of resources from most to least responsive.

Beyond the question of operational capability, it would be inappropriate to differentiate between existing and new capacity, though as provided in certain markets it may be appropriate to offer options (such as somewhat longer commitment periods) to new resources that would not be available to existing resources.[5] It would also be inappropriate to discriminate between sources of firm capacity simply based on the particular technology or resource.[6] A market for firm capacity has to be a market for capacity that is firm in order to deliver efficient resource adequacy solutions. As has been demonstrated in several markets, this also means that *any* resource capable of avoiding involuntary curtailment of load must be allowed to participate on equal footing with all other such resources. This includes demand response as well as energy efficiency measures. Function is all-important. More work is required to ensure that all firm-capacity-equivalent demand response and energy efficiency resources are readily able to participate in such markets. Performance standards for demand-side resources must not arbitrarily be set higher than those for supply-side resources, and care must be taken to ensure that market rules do not arbitrarily discourage investment in otherwise competitive demand-side resources.[7]

3. Going forward, should centralized capacity markets be designed to meet additional or different goals than those established to date?

As real-time market price signals improve and demand response becomes more well established as a significant factor in the markets (in part as a result of the opportunity to participate in capacity markets but also as a result of recent and ongoing advancements in the cost and performance of information and communication technologies allowing customers more options for engagement with markets), the case for centralized capacity markets of any kind may become more marginal; in any case the approach to determining what constitutes "resource adequacy" will need to be revisited. Historically, and at the moment, regulators and politicians stand in for customers in setting reliability standards (in

[5] For example, ISONE allows new resources clearing the FCM the option to enter into commitment periods of up to five years, whereas existing resources are limited to one-year commitment periods.
[6] It is unfortunate that capacity markets, in serving their stated function, may in some cases extend the lives, at least in the short term, of "old dirty" resources. While we accept that all viable capacity should be considered when assessing resource adequacy, FERC may wish to consider, depending on the surrounding policy context, market designs that, for instance, relegate some resources to a lower ranking in a tiered market structure by virtue of their emissions profiles unless they are uniquely capable of providing the system with some specifically identified operational capabilities.
[7] Efforts to facilitate participation by demand-side resources should not be used to circumvent other important policy objectives. ISO New England's recent decision to prohibit "dirty BUGs" (back-up generators whose emission profiles exceed what is permitted for supply-side generators) except in system emergencies is a good example of striking a practical balance in this regard.

the form of target loss-of-load expectations, target planning margins and the value of lost load, or "VoLL" implied by these targets). As others have pointed out, the VoLL implied by current administrative standards can range from $65,000/MWh to $350,000/MWh or more depending on the particular standard and how it is interpreted. This is many times greater than the value most economists have suggested that all but a very tiny percentage of customer loads would pay to avoid an interruption in service. (A 2013 London Economics study for the British Government's Office of Gas and Electricity Markets, for instance, estimated the average on-peak VoLL for residential and SME customers to be a bit less than £17,000/MWh.)[8] This is compounded by the fact that customers realize virtually no benefit from this added measure of insurance since the reliability of their service is dictated by the much lower effective reliability standard for the transmission and distribution systems.

It is tempting to suggest that customers have been overpaying for "resource adequacy" for a long time, but in the absence of real demand participation it would be presumptuous to second-guess the regulators and elected officials who are tasked with the important role of safeguarding customers' interests. Nonetheless, as demand is increasingly able to participate in the decision as to whether the all-in cost of an increment of production is higher or lower than the value of an increment of load, it will be appropriate to re-examine periodically the role of central administrative proxies for the value of lost load. It is entirely possible that the actual quantity of firm capacity needed to provide an "adequate" supply of resources will be less than was previously believed.

Even under close-to-ideal circumstances it may well be prudent to plan for yet an additional margin of firm resources over and above the level of investment a well-functioning energy and services market can be expected to deliver. It is perhaps unrealistic to expect that risks of, for instance, market failure, policy failure or political interference in markets will ever be reduced sufficiently to do otherwise. (Though it is worth noting that recent disputes over issues such as the MOPR demonstrate that capacity markets themselves will encounter many of the same challenges.) The value of this administratively imposed margin for error, or insurance premium if you will, would represent money that is truly "missing" from a functioning market, and for this reason some form of capacity market may well be an enduring feature of competitive wholesale power markets. However this must not become an excuse for failure to address the effectiveness of the energy and services markets in driving value to those resources of greatest value to a rapidly evolving power system.

This is a much more important issue where a large share of supply comes from variable renewables, since the maintenance of artificially high standards for the required quantity of firm capacity will be particularly burdensome in such a system in many ways, expense and land use being only the most obvious. This is perhaps just a different way of looking at the value that more active demand participation in the market will have in the future electricity system.

[8] London Economics (July 2013), *The Value of Lost Load (VoLL) for Electricity in Great Britain: Final report for OFGEM and DECC*, retrieved 9 Sept 2013 from https://www.ofgem.gov.uk/publications-and-updates/electricity-balancing-significant-code-review-draft-policy-decision