

The Brattle Group

Current Topics in Energy Markets & Regulation

About this Newsletter

In this issue of ENERGY, we look at how changes in the power industry are affecting integrated resource planning (IRP). Fundamental changes in fuel markets, capital costs, and new environmental concerns have upset utility resource planning, creating much more uncertainty than traditional IRP can accommodate. In this new environment, a different approach is necessary.

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Reviving Integrated Resource Planning for Electric Utilities: New Challenges and Innovative Approaches

By Marc Chupka, Dean Murphy, and Samuel Newell

Introduction

The electric industry is in the midst of some of the most difficult issues of our time, including climate change, national security, and the impact of high fuel costs on our economy. With unprecedented uncertainty and tradeoffs regarding these issues, resource planning has become a particularly daunting undertaking. It is increasingly difficult to identify the best resource choices, since uncertainties affect alternative resources in different ways, and the resource that is best under some circumstances may perform poorly in others.

In this context, many stakeholder processes have become deadlocked over differences in world views and policy priorities. Yet resource needs are looming in the power industry, with demand in most regions of the country soon to outgrow the capacity surplus created in the last generation boom. Major resource commitments for generation supply, transmission, and demand-side resources will have to be made, despite the uncertainties and risk.

In the current environment, the value of a resource option depends, perhaps primarily, on factors that are largely beyond the control of state regulators and generation suppliers. Such options include changes in fuel markets, rapidly rising construction costs, federal climate legislation, economic growth, organized electricity market conditions, and technological upgrades.

These external factors have created much more uncertainty than has been experienced in the last two decades, when fuel markets and construction costs were more stable and climate change was not a consideration. Today's challenges offer an opportunity to renew focus on the importance of integrated resource planning (IRP).

The views expressed in this paper are strictly those of the authors and do not necessarily state or reflect the views of *The Brattle Group*, *Inc*.

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The Changing Role of IRP



Identifying the best future resource options is difficult, in part because of limitations in the traditional analytic approach to IRP. The IRP approach of minimizing the present value of revenue requirements (PVRR) in an assumedcertain future (augmented with a few sensitivity analyses on what that future might look like) does not sufficiently address either the uncertainties or the multi-attribute nature of the problem.

Traditional IRP does not address whether it is advantageous to make a bet on a promising technology that nonetheless has significant disadvantages in some possible futures. It does not commit only to a plan that performs reasonably well under any potential future state of the world, nor does it pursue short-term strategies such as market purchases that may buy time in the hope that some uncertainties will be resolved. It also does not address the diminished degree of control that utilities and state regulators have over regional market outcomes, particularly in restructured states.

A broader approach must be taken in order to address the enormous uncertainty and tradeoffs among competing policy objectives. Rather than optimizing resources against an assumed future, explicit consideration of the wide range of uncertainty can add valuable insight. Traditional IRP can be enhanced in the following ways:

◆ Identify and characterize a wider scope of potential resource solutions, including aggressive demand-side programs and renewable generation, in addition to conventional supply options.

• Construct a range of plausible, internally consistent scenarios that characterize the range of uncertainty. • Evaluate resource solutions against the scenarios using metrics of performance along multiple outcome dimensions, such as cost, environmental impact, reliability, and fuel diversity. Also, take into consideration future flexibility or options that may be created by resource solutions.

♦ Consider tradeoffs implied by the different resource solutions across scenarios and outcome dimensions, and utility and policy makers' ability to influence outcomes.

All of these elements are necessary in both traditionally regulated states and in restructured states, because both face new uncertainties that are not controllable. However, there is a particular irony in restructured states. Although these states largely abandoned utility-based resource planning in favor of market-based provision of electric supply, many state governments have recently become concerned about the pace and type of new resources being developed in the market environment, and they question whether and how market-based supply addresses climate and fuel diversity issues.

Several restructured states have recently required that their utilities begin to submit resource plans again (e.g., Delaware and Connecticut) and/or have had government agencies conduct resource planning studies (e.g., New Jersey) to inform their policy options.

While these regulators may have less control over resource strategy than in non-restructured states (with correspondingly less cost responsibility assigned to ratepayers), they may still be able to influence the resource mix through a variety of policy levers.

Key Elements of IRP in Today's Policy Environment

Identify and Characterize Feasible Resource Solutions

The scope of potentially viable resource solutions is broader than it once was. In addition to traditional coal-fired and gas-fired supply options, there is also much interest in:

- Emerging low-carbon baseload technologies, primarily new nuclear or coal with carbon capture and sequestration.
- Renewable generating resources, particularly to meet rapidly escalating renewable portfolio standards in many states.
- Demand-side solutions, including both energy efficiency/ conservation and demand response programs.
- Transmission projects with broad market benefits.

Identifying and accurately representing such candidate resource solutions can require detailed characterization of supply, demand, and transmission.

1. Generation Supply. Competing supply options differ in their installed and operating costs as well as their feasibility, lead time, and performance characteristics. Capital costs are most uncertain for new technologies, but the costs of conventional gas- and coal-fired resources are also in flux due to a recent, dramatic rise in construction costs.¹ These wide-spread cost increases affect technologies differentially and future cost uncertainty is particularly pronounced with capital-intensive technologies such as coal, wind, and nuclear.

Feasibility and lead times for new technologies have always been prone to uncertainty, but increased intervenor objections to traditional technologies such as coal have also created uncertainty about the ability to install new resources in a timely fashion. For renewables, resource quality (such as wind patterns) and state requirement rules must also be considered.

2. Demand-Side Resources. While demand-side resources have always been a conceptual part of IRP, in practice they have not always been an important focus. The current uncertainties facing supply resources, and in some cases regulatory pressure, are causing a resurgence of interest in demand-side alternatives. The key questions regarding demand-side resources include: what will they actually cost, how quickly can they be deployed, and what will be the ultimate customer penetration rates and program effectiveness?



Alternative Demand-Side Resource Solutions

1. Chupka, M. and Basheda, G., "Rising Utility Construction Costs: Sources and Impacts," The Brattle Group, for The Edison Foundation, September 2007.

These questions can be addressed by either a "top-down" approach in which lessons from other jurisdictions are adapted, or a "bottom-up" approach in which potentially dozens of different program types are considered explicitly. In either case, a familiarity with the lessons learned from around the U.S. can greatly expand the range of options to be considered. It is also necessary to account for the existing programs, infrastructure, and customer base in the area.

3. Transmission. Transmission can provide numerous economic and reliability benefits, and facilitate better utilization of existing and potential new generation resources, including renewables. However, more transmission may not always improve performance on all dimensions. Transmission that allows better access to remote fossil generation can in some cases reduce costs but increase emissions, and even when it has clear benefits, they must be weighed against its costs.

Assessing transmission options against competing local generation or demandside options requires characterizing specific potential projects and modeling them in both reliability and economic models. However, transmission planning is often performed separately from IRP, e.g., by a Regional Transmission Organization (RTO) or by retail utilities that have been separated from the generation company.

Even in an integrated utility, the resource planning and transmission planning functions are often separated. Therefore, it is important to assess the likely future additions to the transmission system and to incorporate them into the analysis of resource options.



Construct Plausible, Internally Consistent Scenarios

The external, uncontrollable effects of fuel prices, construction costs, climate change legislation, economic growth, and technological change may not simply vary by a few percent along a well-behaved continuum. Rather, they may exhibit significant, discontinuous shifts in ways that are interrelated with other factors. In this context, the traditional approach of forecasting a deterministic (expected) future and performing single-factor sensitivity analyses may not be sufficiently informative. Testing candidate resource solutions against scenarios that address the range of plausible future trajectories of external factors, and their interrelationships, can more effectively support planning in an uncertain environment.

Constructing internally consistent scenarios that capture plausible (and interrelated) future settings of uncertain, external factors requires expertise in energy and climate policy, fuel market relationships, the impact of retail price changes on electricity load forecasting, and the market impacts of future load and resource balances in electricity markets.

1. Climate Policy and Legislation. In addition to emerging state and regional climate change policies, most observers believe that federal climate change legislation is likely to be enacted within the next several years. The most likely regulatory framework is a CO_2 allowance cap-and-trade system, either applied upstream (and raising fossil fuel prices in proportion to carbon content) or directly on generators, requiring them to submit CO_2 emission allowances based on their use of fossil fuels.

The potential for CO_2 prices to have a significant financial impact on carbonintensive resource options can no longer be ignored in long-run resource planning, or even relegated to a sensitivity case. However, the future CO_2 price-trajectory is still highly uncertain and potentially extremely volatile, particularly under a cap-and-trade policy approach that lacks a "safety valve" price cap. Scenario analyses should not

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CASE STUDY: **CONNECTICUT INTEGRATED RESOURCE PLAN STUDY**

In response to legislation requiring Connecticut utilities to jointly prepare a 10-year integrated resource plan, The Connecticut Light & Power Company and The United Illuminating Company retained *The Brattle Group* to conduct the analysis and help prepare the plan. The plan was submitted to the Connecticut Energy Advisory Board (CEAB) in January 2008.

Resource solutions were analyzed in the context of the ISO-NE energy and capacity markets, across four scenarios spanning a range of plausible futures. These scenarios characterized uncontrollable external factors such as fuel prices, climate change legislation, economic growth, and generation capital costs. All cases were analyzed using DAYZER, a locational marginal price (LMP) market simulation model, with a detailed representation of the ISO-NE transmission system. They also characterized the ISO-administered energy market.

Multiple evaluation metrics were examined in order to inform policy recommendations that addressed the economic and environmental policy objectives specified in the legislation. These metrics included market prices, resource costs, customer costs, natural gas consumption, and CO_2 emissions.

Key findings included:

Resource Outlook

◆ Resource Adequacy: ISO-NE's resource adequacy needs are satisfied for the next several years, and Connecticut's local resource adequacy needs are satisfied for the foreseeable future, owing to recent and soon-to-be completed investments in transmission and generation.

◆ Markets: External, uncontrollable factors are the primary drivers of customer costs. Natural gas dependence will persist, and market prices for energy will continue to be high and volatile. However, high energy prices will also lower the net cost of new entry for combined-cycle capacity, thus mitigating capacity prices.

◆ Renewable Generation: Renewable portfolio standards are unlikely to be fully met with renewable generation.

Comparison of Resource Solutions

◆ Aggressive DSM that offsets growth for ten years has the lowest, or nearly lowest, cost across all scenarios, while also reducing emissions and natural gas usage.

• Nuclear and DSM mitigate CO₂ emissions more effectively than other resource solutions.

• Non-gas baseload generation would significantly reduce dependence on natural gas.

Effect of Market-Based Pricing

• Mechanisms such as long-term contracting or utility ownership can help to mitigate customers' exposure to volatile short-term market prices.

Resulting policy recommendations, which recognize the realities of Connecticut's restructured electricity market, included:

◆ Substantially increase utility investment in demand-side management (including energy efficiency).

• Allow the utilities to explore alternative procurement structures such as longer-term contracting.

• Reevaluate the structure of Connecticut's Renewable Portfolio Standard.

◆ Consider ways to enable the development of nongas-fired baseload generation resources to mitigate customer exposure to the price and availability of natural gas.

This was one of the first IRPs to be conducted in a restructured state and to address the challenges of managing customer costs in an RTO-type market while also addressing CO_2 emissions, dependence on natural gas, and renewable portfolio standards.

only include a carbon price case, but a range of carbon prices, as well as their interaction with other factors like fuel prices and electric demand.

2. Fuel Markets. Fuel prices, particularly for natural gas (which sets the power price most of the time in many markets) have been higher and more volatile than at any other time during the past three decades. Moreover, fuel prices could shift again to very different levels, depending on natural gas demand growth (potentially influenced by climate legislation), the development of LNG infrastructure, and supply conditions. Constructing realistic scenarios requires considering current futures market data, U.S. and global fundamentals, and the relationship between fuel prices and climate policy.

3. Load Forecasting. Load forecasting has always been the starting point for resource planning. In a scenario analysis, it becomes necessary to consider the long-term load forecast in the context of other scenario variables. For example, electricity demand will fall (or grow more slowly) when power prices are higher, all else equal. This effect can be analyzed via the long-term price elasticity of power demand considering the effect of fuel and CO_2 prices, and whether customers pay a market price or a regulated cost-of-service price. Load can also be affected by the effectiveness of demand-side management (DSM) programs and changing efficiency standards, both of which may interact with price responsiveness.

4. Capacity Balance and Capacity Markets. In restructured states, the value of new capacity depends on the amount, pace, and mix of merchant development and unit retirements, as balanced against power demand. The value of capacity can also be affected by the structure and rules that govern capacity, which can feed back into the amount of development and retirements.



Evaluate Resource Solutions on Multiple Dimensions

After constructing and identifying scenarios and candidate resource solutions, some form of electricity system simulation model is likely to be necessary to evaluate outcomes. This is conceptually similar to the resource planning models that have long been used. However, rather than focusing on optimizing the resource mix in the context of a deterministic future, there is more attention paid to simply evaluating specified resource solutions and comparing them across potential scenarios.

Since it is difficult to fully characterize the potential range of uncertainties and their interrelationships, it can be very helpful to illuminate the potential range of outcomes and the sources of value and risk under a given set of resource solutions. Armed with these insights, further refinements can be made to the most advantageous resource solutions.

A locational marginal price (LMP) market simulation model may be useful for resource planning in regions that are part of an RTO because it can accurately reflect the RTO's operation of the transmission system as well as the locational market environment.

In some markets, however, a simple production costing model will suffice. In any case, simulating the market makes it possible to evaluate the total cost, environmental, and fuel diversity impacts of each candidate resource solution. Locational market simulation is important when resources are location-specific (e.g., many renewable resources) and when transmission congestion and investment are associated with certain resource choices. Designing the metrics that best describe these many impacts presents its own challenges.

Customer Cost. State policy makers and regulators are often interested primarily in mitigating customer costs. The factors determining customer costs can depend strongly on the regulatory regime governing generation. Under a market-based regime, customer costs are determined by market prices for energy (including the overall impact of financial transmission rights), capacity, ancillary services (accounting for various settlement charges or rebates), and renewable energy credits, as well as transmission and distribution costs.

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Addressing competing challenges in the context of increased uncertainty and limited regulatory control demands a new approach to resource planning.

Under a cost-based regime, customer costs are determined based on utilities' actual costs of fuel, 0&M, emission allowances, and the embedded costs of the generation capacity potentially influenced by regulatory rates on cost recovery.

Many customers face a combination of market- and cost-based or fixed-price generation; cost-based utilities make some wholesale purchases and sales at market prices, and some customers in restructured states are served in part via long-term contracts that are not exposed to current market forces. The appropriate metric for a jurisdiction must account for customers' actual exposure to market vs. regulated prices.

Total Resource Cost. Policy makers may also be interested in quantifying the total going-forward resource cost to serve load. This reflects the total economic cost irrespective of who pays or benefits, and does not consider market prices or ratemaking principles. This metric is relevant even to customers in a market-based environment because resource costs can affect customers in the long run. Average Costs/Rates. From the customer cost and resource cost, one can also calculate the average rates or average resource costs (in ¢/kWh). However, caution must be used with this measure, since average rates and costs can easily be misinterpreted. Average costs or rates may not accurately reflect value when the quantity of consumption is not constant, as is typically the case when comparing demand-side programs with more traditional supply-side solutions, or when evaluating scenarios in which price affects demand.

Environmental Impacts. Emissions of CO_2 , NO_x , and SO_2 are readily quantified from the outputs of a simulation model and are an important outcome measure in their own right. However, care must be taken to ensure that the study captures effects such as whether a CO_2 emissions decrease in one region might imply an emissions increase in another region due to changes in power flows.

Fuel Diversity. Fuel diversity is rarely defined or quantified, except in terms of percentage of generation by fuel type. Care must be taken with such a measure, since the ultimate objective of fuel diversity is usually to reduce

dependence on fuels with unstable prices, potential availability or deliverability constraints, and uncertain environmental costs. In such cases, the absolute quantities of fuels used, rather than their percentage share, may better reflect the underlying concerns in cases where overall generation levels may differ. It must also be recognized, however, that fuel diversity can come at considerably higher average costs.

In many states, renewable portfolio standards require load-serving entities to source a given percent of retail sales from renewable resources – and the required percentages are beginning to escalate rapidly in many regions. The resource planning process must account for the prospects of additional renewable development, as well as the potential financial consequences of failing to attain the required targets.

Renewables Standards. Promoting renewables and satisfying state-mandated renewable portfolio standards is often listed as an explicit policy objective, and progress against such objectives is easily tracked. However, the value of renewables overlaps with climate and fuel diversity objectives

(while putting upward pressure on costs) and should be considered accordingly.

Transmission Investments. Traditional resource planning efforts have generally been focused on evaluating supply resources without explicit evaluation of associated transmission investments. With the location-specific nature of many supply resources and a competitive generation environment where it is difficult to control the location of supply additions, it has become increasingly important to evaluate supply or demand options in the context of transmission constraints and transmission investment requirements. This generally requires planning models, such as LMP simulation models, that can evaluate generation in the context of the existing grid and transmission investment options.

These metrics can provide policy makers with the kinds of information they need to identify preferred resource solutions in the face of large uncertainties. However, it is important to recognize from the start that it is unlikely that a single resource solution will be superior on every metric across all scenarios. Often a "robust second best" solution will present a more favorable value/risk profile than a solution that appears optimal in some scenarios (on some dimensions), but may perform poorly in others.

Compared to focusing on optimizing a single cost-based metric (such as minimizing PVRR) in a narrowly-defined forecast of future conditions, a multi-attribute scenario analysis can be more difficult to perform, but is likely to lead to much greater insight into potential tradeoffs and risks. These considerations can lead to the selection of a resource solution that performs fairly well across a broad range of scenarios, even if it dominates none.

Consider Tradeoffs and Options to Influence Outcomes

In non-restructured states, utilities and public utility commissions have substantial control over resource development, and customers must pay for approved projects. In restructured states, market participants make resource decisions and face the financial consequences, and regulators and indeed the utilities themselves, have much less control.

However, regulators in restructured states can typically still control the amount and types of demand-side management programs that are developed by retail providers, and this should be informed by IRP studies. State governments can also exert substantial influence over the generation resource mix through a number of mechanisms, including:

◆ Allowing utilities to own certain assets or sign long-term contracts for certain resources to serve customers who have not migrated to competitive suppliers, while guaranteeing recovery through rates.

• Providing tax credits or other incentives to encourage development of desired resources.

• Setting renewable portfolio standards.

◆ Permitting utilities to procure energy under longer-term contracts (with guaranteed recovery) to mitigate customers' exposure to short-term market prices. ■



CONCLUSION

The need to address rising customer costs, climate change, and fuel diversity is motivating a resurgent interest in integrated resource planning. Addressing competing challenges in the context of increased uncertainty and limited regulatory control demands a new approach to resource planning.

The four enhancements to traditional IRP efforts described herein provide the needed analytic framework, as demonstrated in their application to the Connecticut IRP study. Executing IRP with these enhancements requires up-to-date expertise in related analytic fields that have not traditionally played an important role in IRP, including: generation economics, fuel markets, climate policy analysis, demand response program evaluation, and RTO market and transmission simulation modeling.

Companies that are willing to do this will be able to better assess uncertainty and manage tradeoffs in today's challenging resource planning environment. In doing so, they will also improve their ability to influence stakeholders and regulators, thereby enhancing their ability to implement the resource strategy they ultimately select.

The Brattle Group's Capabilities

Energy utilities in both regulated and restructured energy markets must assess the value and risk of resource strategies to meet future energy needs. Recent market events have amplified the uncertainties facing utilities: future fuel and power prices, the cost and performance of supply- and demand- side resources, evolving environmental and climate regulations, and customer behavior.

Against this backdrop of uncertainty, utility resource planning faces intensive scrutiny from both regulators and investors who seek assurance that a company has properly balanced the potential value of an investment program with its inherent risks.

This places a premium on coherent analytical approaches that address fundamental value and risk characteristics and provide meaningful insights into key opportunities and tradeoffs. The Brattle Group offers this planning advice to electric, gas, and other utilities, regulatory authorities, and government agencies. We offer a blend of energy market experience in the U.S. and abroad, with expertise in finance, market structure, market design, and regulation. Our economists have a deep understanding of the uncertain factors that drive energy resource decisions.

We have extensive analytic expertise in a wide variety of applications, including resource and business planning decisions, energy policy matters, and commercial disputes. Our clients benefit from *Brattle's* comprehensive skills in system simulation and financial modeling, market analysis and forecasting, cost of capital, option pricing, decision analysis, and risk management. We also understand the importance of incorporating energy risk management strategies, utility rate proceedings, and transmission analysis. Our broad experience in analyzing the interrelated factors that influence energy markets makes us ideally qualified to help utilities plan in the face of the much greater uncertainties that now prevail. Our energy resource planning experience includes engagements in the following areas:

- Utility resource planning and economics
- Integrated supply-demand and power systems modeling
- Demand response, demand-side management, and load forecasting
- ◆ Climate policy analysis and modeling

About the Authors



Principal

Mr. Marc Chupka has over two decades of public and private sector experience analyzing the market impacts of both domestic and international energy and environmental policy. He has focused on electricity and fuel procurement policies, integrated resource planning, reliability analysis, litigation in Clean Air Act matters, renewable energy policy design, and estimating the impact of climate change policies on the energy industry and other sectors. He formerly served as the acting assistant secretary for policy and international affairs at the U.S. Department of Energy.

Mr. Chupka holds an M.S. and M.Phil in Economics from Yale University and a B.A. in Economics from Yale College.

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Principal

Dr. Dean Murphy is an economist and engineer with expertise in the areas of competitive and regulatory economics, finance and quantitative modeling, and risk analysis. His work has centered on the electric industry, encompassing issues such as climate change policy, contract disputes, competitive industry structure and market dynamics, market rules and mechanics, and price forecasting. He has addressed these issues in the context of litigation, regulatory compliance filings and hearings, and in support of business strategy and decisions. Prior to joining *The Brattle Group*, he was an associate director for air, energy and transportation at the White House Office for Environmental Policy.

Dr. Murphy holds a Ph.D. in Industrial Engineering and Engineering Management and an M.S. in Engineering-Economic Systems, both from Stanford University, and a B.E.S. in Materials Science and Engineering from the Johns Hopkins University.

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Principal

Dr. Samuel Newell is an economist and engineer with expertise in the analysis of electricity markets and their relationship to the transmission system. He supports clients in litigation cases, regulatory proceedings, and strategy matters. He has assisted utilities in incorporating the likelihood of climate change legislation and fuel price volatility into their resource plans. He also has project experience with major market simulation models and leads *The Brattle Group's* locational electricity market modeling efforts in all U.S. RTOs. Prior to joining *The Brattle Group*, he was director of the transmission service at Cambridge Energy Research Associates.

Dr. Newell holds a Ph.D. in Technology Management and Policy from the Massachusetts Institute of Technology, an M.S. in Materials Science and Engineering from Stanford University, and an A.B. in Chemistry and Physics from Harvard University.

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LATEST FIRM-WIDE NEWS

The Brattle Group Estimates \$1.5 Trillion Needed in Utility Infrastructure Investment Through 2030

Brattle has determined that growing demand for electric services will require investment on the order of \$1.5 trillion between now and 2030. Peter Fox-Penner, co-chairman, presented the preliminary findings in April at The Edison Foundation conference "Keeping the Lights On – Our National Challenge."

The study projects generation, energy efficiency, transmission, and distribution investment needed in the U.S. between 2010 and 2030, factoring in a range of capacity deferrals that are possible through the implementation of energy efficiency programs. The study notes that new and replacement generating plants will cost about \$560 billion through 2030, absent a significant expansion of efficiency programs or new climate initiatives. Transmission and distribution will require nearly \$900 billion by 2030, under current trends and policies.

The full report, on which these preliminary findings are based, is sponsored by The Edison Foundation and will be available this fall.

Brattle Recommends Incentives to Improve Energy Efficiency in Europe

Senior advisor David Robinson has proposed guidelines for the economic regulation of energy suppliers and recommended incentives for suppliers to help encourage energy efficiency and cost savings throughout the industry.

The paper, "Energy Efficiency: The Belle of the Ball in Bali," recommends incentives for the industry, whether in a regulated or competitive market. Guidelines include the importance of reflecting accurate underlying whole energy prices, ensuring that environmental benefits are explicitly included in any analyses, and providing incentives to keep economic costs as low as possible.

Principal Coleman Bazelon Testified Before U.S. Congress on Recent Wireless Spectrum Auction

At a Congressional hearing on April 15 regarding the recently concluded Federal Communication Commission's 700 MHz spectrum auction, Coleman Bazelon, a principal in our telecommunications practice, described how ill-configured spectrum license blocks and a poorly designed auction resulted in an unfortunate outcome for the wireless industry.

Bazelon, who was involved in the auction on behalf of clients, testified that the auction failed to meet the goals set forth by the FCC. He noted that the spectrum license blocks were poorly configured, stating "If the spectrum blocks had been configured differently, the auction could have raised as much as an additional \$5 billion from bidders that were shut out."

Brattle Offers Issue Brief on Litigation Risks of Expanding Subprime Crisis

Principal George S. Oldfield has authored a brief on the increased litigation risks of late regarding the fallout of the subprime mortgage crisis. This piece follows up a 2007 newsletter "Subprime Mortgage Problems: What to Look For and Where to Look." This latest brief offers a view of spreading credit and insurance problems in the finance industry, and explains possible litigation risk in light of current uncertainty.

Principal Hannes Pfeifenberger Presented at WIRES Meeting on Assessing Transmission Benefits

Hannes Pfeifenberger, a principal in *Brattle's* Cambridge office, presented at the Working Group for Investment in Reliable and Economic Electric Systems (WIRES) meeting in Washington, DC in February. His presentation, "Assessing the Benefits of Transmission Investments," noted that while most transmission investments are justified through reliability projects, there are significant opportunities to improve transmission grid and power markets through economically-justified transmission projects. His presentation also discussed quantifying a wide range of transmission benefits, showing that, because of complex market interactions and the broad economic costs of inadequate transmission, economic analyses of transmission investment frequently understate the facilities' true benefit.

Study on Benefits of Dynamic Pricing Presented at NARUC Annual Meeting

At the annual meeting of the National Association of Regulatory Utility Commissioners held in February, a whitepaper on the benefits of dynamic pricing in the electric industry was distributed by The Edison Electric Institute, the paper's sponsor. The paper helps utilities faced with problems posed by aging infrastructure by laying out a methodology for quantifying the costs and benefits of implementing dynamic pricing and advanced metering infrastructure. Principal Ahmad Faruqui was the lead author of the study "Quantifying the Benefits of Dynamic Pricing in the Mass Market."

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- Telecommunications and Media
- Transportation

About The Brattle Group

The Brattle Group provides consulting services and expert testimony in economics, finance, and regulation to corporations, law firms, and governments around the world.

We combine in-depth industry experience, rigorous analysis, and principled techniques to help clients answer complex economic questions in litigation, develop strategies for changing markets, and make critical business decisions.

We are distinguished by:

- Thoughtful, timely, and transparent analyses of industries and issues
- Affiliations with leading international academics and highly credentialed industry specialists
- Clearly presented results that withstand critical review

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