Action Proposal

Creating Balanced Energy Market Structures

2005 Bordeaux Energy Colloquium
September 29th- October 2nd, 2005

Background:

Now in its fifth year, the Bordeaux Energy Colloquium was originally created to bring together the voices of various industry constituents to engage in a series of dialogues regarding the creation of a competitive energy marketplace. Structured around the benefits of trans-Atlantic exchange, invitations are sent to high-level representatives of each sector involved in deregulating the energy market including utilities, grid operators, generators, industrials, financers, regulators, legal experts and environmental specialists.

In essence, the Bordeaux Energy Colloquium operates in the spirit of "action research", where industry experts can step back from day to day issues and focus on the changing dynamics of the global energy market place. Each year, colloquium members consider key variables within various contexts and evaluate their effect on the global transition trend from regulation to competition in energy markets. The Colloquium's format deliberately maintains a small setting of select participants with diverse views and different disciplines to bring a new level of creative thinking to this complex challenge.

In opposition to the globalization formula of “one deregulation formula fits all”, the 2005 Bordeaux Energy Colloquium sponsored the idea of an *Energy Plexus*. An Energy Plexus is created through building a global network of leading minds and best practices devoted to finding and replicating the factors of success found in

functioning energy markets. Through evaluating policy frameworks, the role of innovation and new technologies, the impact of environmental and natural resource restraints and legal and financial mechanisms - the Fall 2005 Colloquium evaluated options from a “big picture” perspective and attempted to distill their essence into specific actions to be implemented.

Special presentations and the guidance of session Chairs ensure rigorous evaluations of the issues and a collegiality that respects many different opinions. Members of this year’s Colloquium (see appendix A) addressed many existing paradoxes that embody the tensions between the current status quo and a desired future for competitive energy markets. 2005 Colloquium members agreed that the fundamental imbalance that exists in how supply and demand options are valued is a key stumbling block in the proper functioning of energy markets.

The following proposed steps and recommendations, attempts to identify important points of leverage that can be used to further unleash the energy systems potential in favor of new lines of development. Although this report attempts to represent the diverse viewpoints of all of the Colloquium participants, the final report is issued under the auspices of the Bordeaux Energy Colloquium and participants were not asked to agree to the wording of the final copy.

Introduction:

Competitive energy markets continue their evolution within the inherent policy tensions between government regulation and free markets. While markets have gained significant ground, questions about the vulnerability of national energy systems and an over-reliance on fossil fuels have contributed to a re-assessment of the role of government regulation. Many industry leaders recognize that a major energy transition is underway. The complexity of large-scale system change has created crisis in some markets, and volatility and uncertainty in others.

Leaders within the industry need to bring a great deal of pragmatism to the task of managing and changing contexts in an “edge of chaos” environment. Borrowing the image of the “butterfly effect” from chaos theory, small but critical changes at critical times can trigger major transformative effects. Complex policy decisions assume a new and even more powerful dimension, in that as humans, we have the ability to reflect on various contexts and choose the points in which to intervene. In developing this idea further, this year’s participants took on the task of searching for ‘do-able’ high leverage initiatives that can trigger a transition to a global energy future that is cleaner, more secure and more sustainable.

The Value Proposition

A necessary, but not sufficient, condition of a sound market is to ensure that all actors capture or bear the full economic consequences of their actions. Unless a market is efficient in facilitating this effect, the substantial efficiency benefits promised by markets are not fully achievable. Today's U.S. electricity markets suffer from a one-sided market design that generally insulates purchase prices of consumers from the highly volatile hour-to-hour production cost changes. Consequently, this leads society to over invest in generation and wires to carry peak loads that could be managed by users at significantly lower costs.

Underutilized peak generation is a key factor deterring the proper functioning of competitive energy markets. Inherent in a market design with a 'supply side' bias, is an ever-increasing dependence on fossil fuel use and their associated pollution. However, a more critical effect of this market distortion is the severe limitation it places on demand response – the customer's ability to respond to fluctuating pricing signal through control of their demand. Demand response programs in electricity markets are still underdeveloped, while the potential benefits of bringing demand response into market activity parity with production are enormous.

There is reason to believe that the country's appetite for advancing demand response and efficiency is increasing. The unfortunate fact that energy costs

have risen dramatically, immediately improves the economics and incentives of demand response programs. As the energy crisis of the late 1970's proved, high energy prices both decreased energy consumption and caused dramatic increases in the electricity systems overall efficiency. Given today's mantra for more energy 'self-reliance', demand that is exposed to real pricing signals, will respond accordingly.

Perhaps as important, technology has advanced significantly, especially in the areas of "real time" measurement for small loads, and in "smart" devices that can be integrated into appliances and respond automatically to system conditions or be "called" in "real time" in response to price. Thus, the cost to the system as a whole to implement "demand-friendly" technologies and policies, continue to decline just at the moment when the value is most readily apparent.

Under current retail price structures, the value of the action to the system is likely to be significantly different than the value of the action for the end user. For example, turning off a light at 2 a.m. has a much different impact on production cost than turning off a light at 2 p.m.; but the financial consequence to the end-user is likely to be the same - eradicating any incentive or motivation to pay attention to 'time of use' consumption. When extrapolated from the individual to a larger system model, the elimination of uneconomic demand across the board holds the potential to lower rates to all, while simultaneously improving the competitiveness of the state/country initiatives and creating new jobs.

The following example illustrates the potential financial impact for end-users when they are allowed to exercise choice through demand response:

- Company X produces $20 million of goods per year or $10,000 of goods per hour.
- Electricity costs of $50/MWh represent 5% or $500 per hour with 10 MW of demand.
- Operating profits are 15% or $1500 per hour.

If 'on-peak' electricity costs rise by a factor of four to $200 per MWH, the plant would operate at break even. Under a theoretical demand response program, the plant could chose to limit production during peak hours and 'sell' demand reduction back to the system. In exchange it could receive 10 MWh times $200 or $2000 per hour operating profits. Under this scenario the industrial could realize $500 per hour more profit than operating under 'real time' electric costs.

These are relatively typical factory numbers, illustrating the likely amount of demand reduction when spot prices reach $150-$200/MW. In reality, average retail pricing systems have seen spot prices rising much higher, in the range off $1000 to $7000/MWh. When exposed to the 'real time' cost of electricity, major industrial customers may actually find profits in reducing their production. Yet

without pricing transparency and proper incentives, this blind-spot leads to consumer behavior that creates a dead-weight loss to the overall economy.

We have articulated below a series of steps that should be taken to advance the participation of DSR in the electricity market. Not all steps are equally applicable to all customer groups, of course; for larger customers, the development of better rate designs or greater ease of direct market participation may be key; for smaller customers, finding ways to increase the penetration of user-friendly and inexpensive technologies may be the most pressing. Nevertheless, we see a value in advancing on a broad front, in part to ensure that all customers (and all relevant political constituencies) have visible and useful opportunities to participate.

First Step: *Create cost based tariff structures that capture the 'true' cost of supply production and the value of demand reduction*

A flawed assumption inherent in determining electricity pricing, is that the cost for transmission and distribution wiring is inevitable and should be treated equally whether it involves running large spans of overhead lines or bringing new underground wires through congested city streets. The first step toward enabling purchasers of electricity to become price responsive must be to measure consumption on the same basis as production scarcity is measured. That is to

say, consumption must be valued on a location basis and include regionally specific production and distribution costs as well as the time of use. Increasing peak demand in downtown areas has a different cost than the same increase to a more remote location. When growing peak demand is causing a need for more wires, the expected new wires costs must be accounted for and distributed regionally as well as across the actual hours that are causing the peak.

Today, most small consumer consumption is measured on a monthly aggregate volume basis, while scarcity is measured on an hourly basis. Since scarce consumption is not fungible on an economic basis with surplus consumption, this difference must be quantified before any other action can have an effect. This point is more crucial for electricity prices as electricity is the rare commodity that is both produced and consumed at virtually the same moment in time. Further, markets for electricity move from surplus to scarcity and back again in minutes, rather than days or months. Generally this must take the form of more discrete (hourly or less) recording of consumption.

Action:

Encourage regulators to facilitate the deployment of measuring equipment at the consumer location that will allow the recording of usage in time intervals equivalent to those that measure production. Recent improvements in metering

technology have greatly reduced the cost of such “smart” meters. While it may be impractical or unnecessary to deploy such equipment ubiquitously, its wide availability and installation will provide the critical mass to encourage the development of business plans to take advantage of the new monitoring and control capabilities.

For larger customers, metering technology may already be in place; for these customers, the more important task may be to ensure that there are no restrictions on the access to, or use by, customers of the data concerning their usage. Interval meters should be installed on a “need to know” basis. That is, large consumers that volunteer to respond in real time must have interval meters. However, small consumers may not need interval meters where aggregators actually control the electric consuming devices (such as with radio-controlled switches on residential air conditioning compressors, hot water heaters, etc.). Obviously, the third party must be able to verify that the residential consumers’ electrical consuming devices were actually turned off, but this may not require expensive meters on every house.

In all cases, the underlying assumption is that an aggregator (the utility or a third party provider) has timely access to consumption data. To date this is not the case for most states with the notable exceptions of Texas and Massachusetts, which have affirmatively stated that consumers can access their data on their own terms. Existing rules in California, for example, place the onus on utilities

who tend to select a method that works best for them and not necessarily for their customers.

It bears repeating that regulators must acknowledge that consumers have a right to their own consumption data. In order for innovative new products and services to be developed by market players, access to meters and meter data must be standardized and consumers must be able to control who sees their data and how they see it.

Second Step: *Align Prices with Costs*

Once consumption is measured on the same incremental basis as production scarcity, the second step toward more price based elastic demand is to allow consumers, both large and small, to voluntarily respond to hourly and day-ahead prices.

RTOs such as PJM make hourly production prices available to all, but ignore distribution costs. Average transmission and distribution losses are 7.5% for the US, but exceed 20% on peak. In a recent example, Nstar successfully claimed 22% peak losses in rate filings. An often ignored fact is that a peak KWh of either local generation or demand reduction can actually save 1.25 KWh of generation. Without aligning the price of electricity to the real costs of

production, consumers are completely insulated from short term price volatility by default and are given no incentive to conserve during critically expensive peak periods.

Many consumers would understandably prefer to insulate themselves from short term price volatility, and with retail choice, utilities and energy providers can create a host of pricing package options suitable to a consumer's appetite for pricing fluctuations. However, standard accounting rules need to be established in order for fair cost-based pricing processes to be established. Once all market players are working off of the same base set of assumptions in establishing the 'real' cost of electricity, conscious choice will ensure that competitive forces have their effect.

It follows from step one, that without flow of consumption data in electric markets, no amount of innovative pricing structures will work and the structural inefficiencies that exist today, although well intended, will remain. Assuming costs can be fairly determined and set, consumers need to be given pricing options in order for the rule of scarcity to effectively regulate supply and demand in the market. While it is likely that many consumers will continue to prefer fully hedged products, inevitably some consumers will want to "sell their hedge" when scarcity occurs in order to reap the benefits of their forward position. Even if a small percentage of customers opt for demand response programs during peak periods, the threat of severe energy crises can be monitored and abated.

Action

Regulatory agencies should be encouraged to permit rate designs that allow the customers that volunteer to “see” the real time (and/or day ahead) cost of the electricity they consume and more importantly to be paid the market clearing price for verifiable reductions of their load. Establishing clear rules for setting the ‘real’ cost of electricity on a regional basis will allow for fair pricing strategies that will re-encourage retail competition. While customers should always be allowed to choose “hedged” products, state level policy should be enacted to create ways for customers to benefit from reductions in usage, particularly in high price periods.

The state of Oregon provides an example where equal incentives were set in its rate structure for energy efficiency and supply expansion investments. Policy incentives for higher levels of energy efficiency and demand response need to be encouraged and built directly into competitive market structures. On a regional basis, power trading arrangements must also reflect the ‘true’ price of the commodity that includes site specific transmission and distribution costs, as well as penalties for congestion management.

Third Step: *Introduce New Technology for Automatic Response*

As stated earlier, the unique characteristic of the electricity commodity is its production and consumption in concurrent real time. This attribute makes designing markets where buyers and sellers come together to agree on price ever more difficult. This fact alone has been one of the most difficult stumbling blocks to the development of electricity consumption that is price responsive to short term scarcity. In this area, new technology (or lower cost existing technology) is needed to solve this issue on a broad basis.

Few electricity consumers will have the inclination or opportunity to watch and respond to price in real time, but some might. It may not be realistic for many small consumers to take action in real time, although price response by aggregated loads of small consumers may be both feasible and effective. Indeed, since the largest savings are available in situations of scarcity, the fact that real scarcity is only experienced in a few dozen somewhat unpredictable hours each year would likely make it inefficient for all but the very largest or most price responsive consumers, or the aggregated loads of small consumers, to follow prices every hour of every day. Put another way, the benefit to most consumers, especially small consumers, of acting on price signals is likely to be relatively small (and difficult to capture), but the collective benefit to the system

and to all consumers of more efficient behavior can be enormous. The question is how to bridge that gap.

An important technological contribution to price responsive loads can now be handled through automated response software based on pre-programmed metrics. The new technology would extend beyond the meter into the most electricity intensive devices in most homes and business. Virtually anything with a compressor or resistor (air conditioning, refrigeration, heating, lighting) is a candidate for automated response to price; all that is required is appropriate telemetry or a surrogate algorithm. For example, while a few degree changes in a thermostat are helpful, a more strategic engagement of an air conditioning unit's compressor may be more effective at mitigating price exposure.

New forms of artificial intelligence in computing may make predictive cooling more feasible whereby systems pre-cool in anticipation of higher prices later. Further, they might wait to cool on anticipation of lower prices a bit later. Much of this technology is available today, but not yet cost effective to install and operate in the mass market. Unfortunately, a manufacturer's decision to add smart features that control demand depends on the market size – how many potential customers could benefit and how large the DSR benefit might be. Without the proper financial incentives that come with transparent real-time pricing, market appetite for these new products remains meager.

Even without a robust market to drive prices downward, the sophistication of internet IP protocols and its 'always on' access offers a ready made platform for new demand conservation products. Tying several 'smart' devices to central servers using these tools will become more feasible and relatively inexpensive. This advance will provide two main benefits: first, it will provide an automation interface that is missing today, and second, it will allow the centralization of dispatch that can account for broad adjustments. It is conceivable that an RTO/ISO could provide an internet server that sends "dispatch" signals to consumption devices of tomorrow, much as production signals are sent to central station generation today.

Action:

Opportunities to articulate the value obtained by actions taken to unload electricity grids at times of short term scarcity should be identified to assist policy makers to implement policies that encourage the development of such technologies. State and Federal grants should be awarded to develop pilot programs within congested regions to prove the efficacy of the technology and the aggregate effect of automated demand side reduction.

Fourth Step: *Develop a Forward Market*

The wholesale and retail electricity markets have not yet developed robust forward market valuation for a commodity proxy for short term demand reductions. Much time has been spent over the last decade building markets that facilitate price transparency for blocks of electricity production. Now is the time to develop the markets for short term "callable" resources of the sort that demand reductions (DR) can deliver. In order to better understand the lack of forward pricing signals for demand response, it is important to describe the characteristics of the commodity DR generally has to offer.

One effect of a lack of forward pricing of the DR commodity has been to largely stifle investment in long term demand response capability in the market. Based on this basic premise, PJM, for example, has undertaken to develop a forward market for a commodity that could reasonably, but not exclusively, be sourced from demand response. This market is designed around a financial derivative product commonly traded in other types of commodity markets; the "call option." This new call option would parallel, on a smaller scale (more friendly to demand products), the forward market for electric energy, now traded in 50 MW increments.

Action:

Support the development of forward markets for demand and supply products.

Conclusion:

Critical to determining the shape of the electric industry and infrastructure is the chosen path of 'next steps' taken. This action plan encourages us to cut through the complexity of restructuring global energy markets and focus on a few key principles that offer the promise of achieving quantum change incrementally. While incremental changes are often viewed as the route to marginal improvements, small changes can also create a critical mass effect where together they build an overwhelming force. In creating a dynamic Energy Plexus, Colloquium members are focused on finding high-leverage initiatives within their sphere of influence that have the capacity to completely shift the current context and as a result realize major changes.

Every new initiative can be viewed as a systemic 'probe' and seen ultimately as a learning opportunity. In the art of creating new contexts, regulators and industry veterans must develop a heightened awareness of the importance of 'boundary management'. New experiments often get neutralized by the status quo. The transformation of energy markets will require the right balance of policy initiatives that help to break the forces of old regime standards while coping with the ambiguity, pressures and uncertainties that the absence of fixed states and clear end points entails.

The challenge of nurturing processes of continuous self-organization in changing energy markets probably needs no further emphasis. Through the contextual analysis of this year's Colloquium members, one way of formulating the dynamic through which the total system can evolve has been developed. Clearly, it is possible to influence the pattern of behaviors that generate demand as well as supply. The key is to design balanced interventions that take advantage of the scope for collaborative action in finding new solutions to our shared problem- the energy future.

Appendix A

Agenda with Participants

Bordeaux Energy Colloquium
Fall 2005

Session 1: *A Vision for Electricity Markets*
Ken Malloy CEO - CAEM
Tom Casten – CEO - Primary Energy

Vision is where tomorrow begins, for it expresses what you and others who share the vision will be working hard to create. Since most people don't take the time to think systematically about the future, those who do, and who base their strategies and actions on their visions, have inordinate power to shape the future.
--Burt Nanus

In light of recent setbacks in restructuring energy markets, most policy discussions are now centered around envisioning a set of modest policy changes at the state level. Two leading visionaries of free-market mechanisms, will outline their views of what it will take to make energy markets competitive.

Session 2: *Drivers and Trends: Energy Markets and Political Reality*

Branko Terzic – Global Regulatory Policy Leader - Deloitte
Ashley Brown- Executive Director Harvard University Electricity Policy Group
Andy Patterson – Sr. Policy Advisor – US Department of Energy
Maria Dubravka, Financial advisor - Scotia Waterous Bank

When one door closes another door opens; but we so often look so long and so regretfully upon the closed door, that we do not see the ones which open for us.
--Alexander Graham Bell

Thinking about electricity is too often done in a silo. Yet dramatic changes are taking place outside the context of electric policy that will have profound effects on how those policies are defined, implemented, and on their impact. This session will review the larger drivers outside of electricity—e.g., oil markets, environmental policy, technology—that will have to be integrated into our thinking. We will also "connect up" and focus on the likely constraints and opportunities that will emerge for electric policy.

Session 3: *Wholesale Markets I—Policy*

Eric Dyevre – Commissioner - Commission de Regulation de l'Energie- France
John Baker – Former CEO - National Power
Tom Welch – General Manager -PJM Interconnect
Branko Terzic – Global Regulatory Policy Leader - Deloitte

> *It is one of the strange ironies of this strange life [that] those who work the hardest, who subject themselves to the strictest discipline, who give up certain pleasurable things in order to achieve a goal, are the happiest people.*
> *--Brutus Hamilton*

One important goal of the Colloquium is to improve the understanding of policy implementation from each side of the Atlantic. The next several sessions will be very fact-based and focused on improving the knowledge base of each of the participants. This session will focus on comparing and contrasting approaches to wholesale market policies, especially focusing on an assessment of the success of those policies and a prognosis for over time.

Session 4: *Wholesale Markets II—Financial*
Piers Hedley CEO -NWCM Financing
John Baker – Chairman - Renewable Energy Holding
John Strom President - Haddington Ventures

> *Nothing that results in human progress is achieved with unanimous consent. Those that are enlightened before the others are condemned to pursue that light in spite of the others.*
> *--Christopher Columbus*

Implementation success stories are first made feasible through the right combination of policy initiative and industrial innovation. The real key to break-through market successes lies in the investment community's confidence to invest. Today's discussion about hot areas for investment such as wind energy and LNG resulted from the financial impetus of private investment. This panel will explore how energy companies are continuing to find new ways of growth after the M&A bubble. It will also look at what new technologies they would back and which geographical areas or market segments are the most attractive for private investors.

Session 5: *Retail Markets I—Policy and Models*

Dr. Stephen Littlechild – International Consultant on privatization, competition, regulation
John Anderson- President ELCON- Electric Consumers Resource Council

Two roads diverged in a wood
And I took the one less traveled by
And that has made all the difference
--Robert Frost

The diversity of policy and models on retail has been mind-boggling. This session will review models in Europe and North America and assess the success of those models, as well as prognosticate about future developments. Consensus and contrast in an overview of the original policy framework intentions in key regions of the US and liberalized countries within the EU. Issues such as phased retail access, commodity trading, demand-side programs and social good programs will be discussed. What will it take to reconstitute retail competition in the US? Where have there been successful models of retail competition in the EU?

Session 6: *Organizing Social Movements*
Jim Spickford – Professor Fielding Graduate University
Ashley Brown – Director Harvard Energy Policy Group

What are the principles behind successful social movements? Deregulation and Liberalization as concepts were ushered in during the Regan – Thatcher period and have evolved into the broader concept of "globalization". Professors Spickford and Brown will lead an informal discussion of how competition is unfolding in other parts of the world and how social movements outside of the energy field are organized for action.

Session 7: *Retail Markets II—Transformational Issues*
Fahim Samaha - CEO – Soffimat
Cody Graves - CEO - Automated Energy
Tom Casten – President - Primary Energy

It is not the road ahead that wears you out-
It is the grain of sand in your shoe.
Arab proverb

Perhaps the "raison d'être" of reform is to radically change the way services are delivered to the customer. This session will review concepts that have the potential to revolutionize retail markets and particular attention will be paid to bundled flowing content, distributed generation, demand response, and information management.

Session 8: *Future Imagining: Policy*

Eric Dyevre – Commissioner French Regulatory Commission
Ashley Brown – Executive Director, Harvard Energy Policy Group
Jorge Vasconcelos – Commission of European Energy Regulators CEER
Tom Welch - General Manager of Market Strategy – PJM

> *Men have been taught that it is a virtue to stand together. But the creator is the man who stands alone.*
> *- Ayn Rand*

A competitive market for energy is still a controversial concept. In North America especially, it has suffered significant setbacks over the last five years. Votes on the European Union threaten progress made in Europe. Ideas have consequences, this is true enough, but Ideas must also have advocates to have consequences. The coalition for competition in the US is at best re-emerging after the Four Horsemen of the Electric Apocalypse: California, Enron, blackouts, and high prices. How can we affect competitive policies for energy markets? This session will also address what impact accurate pricing will have on demand for electricity and how competitive policy will impact on low income consumers.

Session 9: *Future Imagining: The Future is Us!*

> *We must all hang together, or assuredly we shall all hang separately.*
> *--Ben Franklin at the signing of the Declaration of Independence*

In the closing session, we will summarize the weekend discussions and create a call for action. A prioritized approach for short-term action initiatives will be developed and distributed for the creation of a policy recommendation paper.