EMPOWERING CONSUMERS
Through a Modern Electric Grid

SUMMARY REPORT
Illinois Smart Grid Initiative

April 2009

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SMART GRID
Initiative

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More information at *www.ilsmartgrid.org.*

ABOUT

CNT

Since 1978, Center for Neighborhood Technology (CNT) has been a leader in promoting urban sustainability—the more effective use of existing resources and community assets to improve the health of natural systems and the wealth of people, today and in the future.

CNT is a creative think-and-do tank that combines rigorous research with effective solutions. CNT works across disciplines and issues, including transportation and community development, energy, natural resources, and climate change.

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GALVIN ELECTRICITY INITIATIVE

Sponsored by The Galvin Project, Inc.

The Galvin Electricity Initiative, launched by former Motorola CEO Robert W. Galvin, has brought together many of the nation's leading electricity experts to reconstruct our electric power system into one that is much more affordable, reliable and fuel-efficient.

The Initiative has created innovative business and technological blueprints for the ultimate smart grid—a Perfect Power System—based on smart microgrids that best meet the needs of 21st century consumers and provide the most reliable, secure electricity service regardless of nature's wrath or security threats.

For more information on Perfect Power and smart microgrids, visit www.galvinpower.org.

A NOTE ON THIS REPORT

The Illinois Smart Grid Initiative (ISGI) involved an *ad hoc* and voluntary assembly of individuals and organizations interested in improving Illinois' electric power system and services for consumers. The ISGI was coordinated by the Center for Neighborhood Technology with the support of the Galvin Project, Inc., and held four meetings between June and October 2008. This report summarizes much of the information that was presented at those meetings, a complete detailing of which can be found at the ISGI web site: *www.ilsmartgrid.org*. This report also identifies several key policy considerations that CNT believes should be examined in future work to develop the smart grid concept in Illinois, including the workshop and collaborative meetings held under the auspices of the Illinois Commerce Commission. It should be noted that the choice of these policy topics and the method of their examination here does not necessarily reflect the views of all participants in the ISGI process.

PREFACE TO THE REPORT

Center for Neighborhood Technology, April, 2009[1]

For the last eighty years, the electric industry in Illinois has had two legislatively-mandated and stakeholder-supported goals: reliability and affordability. During this time, utility regulation and policy has focused on achieving those goals. And overall, the inflation-adjusted price charged to end use consumers fell throughout most of that period and widespread and persistent blackouts were relatively rare for most communities.

However, times change: the future of electricity in Illinois does not look like the past. The Illinois electric utility industry and its customers are faced with a set of challenges the scope and scale of which are unprecedented since the advent of widespread electrification in the 1920's. These challenges include:

- **Increased likelihood of a carbon constrained future to mitigate the effects of human-induced climate change:** Environmental concerns will continue to place restrictions on the uses of traditional fossil fuel energy sources as the world prepares for, and adapts to, a carbon-constrained future.

- **Significant new infrastructure investment:** Huge new investment needs are required to both replace a rapidly aging electricity infrastructure as well as build to meet new demands. In addition, electricity infrastructure will compete with other public infrastructure needs in the coming years. Investment in the roads, railways and public transport networks, water, sewer, natural gas and oil delivery systems, schools, waterways, airports, and other public infrastructure investment is expected to balloon as existing infrastructure is replaced and new infrastructure is added.

- **New uses of electricity:** Electricity has become a more important energy source as new digital technologies and sophisticated production techniques penetrate markets, which adds to the total demand for power and adds stress to the power grid.

- **Continued globalization:** Local economies will continue to feel pressure from the global flow of capital. Power cost and quality for both consumers and producers will gain importance as local economic growth begins to depend more heavily on the electric grid.

- **Increasing energy prices:** Energy prices have increased dramatically in the last few years; and with demand from the globalization of the economic system increasing, the competition for energy resources will only become more acute.

The scope and scale of these challenges is unprecedented. Not only will meeting them require extensive investment in and adoption of new and revamped tools, technologies, consumer behaviors and governance institutions, but they will require a re-thinking and expansion of the legislatively-mandated goals of the system – in the future, the electricity system will need to meet three goals: reliable, affordable and clean.

The addition of the third goal greatly complicates meeting all three. Decarbonizing the electricity system - even if it occurs over the next generation - by itself is an enormously complex task. Add to it, however, the stresses of globalization, the new uses of electricity and the necessary replacement of an aging and outdated infrastructure - and meeting

1– The views expressed in this preface reflect those of the Center for Neighborhood Technology and do not necessarily represent the views of all participants in the Illinois Smart Grid Initiative, the Galvin Electricity Initiative or the U.S. Department of Energy.

"reliable, affordable and clean" becomes an enormously complex task.

But that is our collective task. And these three goals are increasingly recognized as priorities by policymakers, consumers, and business.

Where do we begin?

We have to begin by acknowledging and recognizing that the first foundational step towards building a new electricity system that meets "reliable, affordable and clean" is that it has to be as efficient as possible. We can no longer afford to waste 70% or 80% of energy inputs. In the past, when fuel or new capacity was perceived as cheap or technology was not available to avoid it, it might have made sense to engineer inefficient solutions or to incent inefficient consumption behaviors. But the future will be different from the past. In light of all the challenges facing the electricity system, "affordability" may be the most difficult goal to achieve and it will only be achieved by improving the efficiency with which electricity is produced, transmitted and consumed.

But to get to that level of efficiency, we need a system that is much smarter, self-aware and interconnected than the system that we currently have. What would be the components of such a system and how would they work towards "reliable, affordable and clean"? A workable definition of "smart grid" would have to begin not by defining "smart grid" from an engineering perspective as a bundle of technologies, but as a new system with four major components, including:

Smart technologies – Smart technologies encompasses both utility-side technologies, better equipment along the wires and poles of the distribution system that turn the grid a dynamic system, as well as consumer-side technologies that encompass appliances and devices that can respond to information about energy prices and grid conditions and adjust energy consumption accordingly.

Smart rates – Smart rates provide opportunities for consumers to reduce their electric bills through energy management, taking advantage of the opportunities that new technologies enable. Such rates must recognize and reward the shifts in risk management that new and innovative rates will create.

Smart consumers – Smart technologies and smart rates create opportunities for consumers. But opportunities are not enough. If those technologies and rates aren't used by consumers, their value is lost. Robust, clear and ongoing educational and marketing efforts will be essential to enabling consumers to make smart choices that optimize their energy use and cost and benefit the energy system.

Smart governance – To take full advantage of the opportunities of the smart grid requires changes in the traditional relationships between utilities, customers and regulators. New rules may be needed for a range of issues from establishing standards of service, consumer protections, rate making and investment decisions, reliability standards with new rewards and penalties, and more.

Recommendations

If our intent is to create a new electricity standard of "affordable, reliable and clean" in a 21st Century context, our challenge is how to accomplish that transition and at what speed. As this report reflects, according to the best experts in the field, part of that transition - perhaps a foundational one - will be the transition from an analog electricity delivery system to a digital one. As the report further indicates, the technologies to make that transition - the hardware and software - already exist and are being deployed by utility systems around

the world. What is missing in Illinois is a relevant governance framework, one that focuses as much on the future as on the past, has the resources to understand the importance, relevance and dynamism of these issues and whose success and accountability metric is - at least in part - how well it does in meeting the new "clean, affordable and reliable" standard.

In order to meet those goals this report contains a discussion of six policy areas that were discussed during the meetings convened by the Illinois Smart Grid Initiative over the summer and fall of 2008 to frame the process of crafting a smart grid policies for Illinois. This analysis identifies several issues that must be resolved to move forward toward grid modernization investments in Illinois. These include:

- Smart grid metrics planning, monitoring, and evaluation;
- Evaluation of smart grid investments from a societal perspective;
- Alternative methods of ratemaking for smart grid investment;
- Non-utiity investment in the electric grid;
- Modification of default service pricing;
- Effect of statutory renewable resources, demand response and energy efficiency.

It is our hope that this discussion will provide a structure for the ongoing smart grid work at upcoming Illinois Commerce Commission workshops and collaborative meetings as well as in other venues.

While the details of those policies are important, and getting them properly resolved is necessary for a well implemented smart grid in Illinois, in its most immediate sense, there are three overarching actions that could be taken quickly and are required now:

1. Explicitly redefine "procurement" so that investments in increased efficiency, whether through public investment or private action and behavior change - be considered on an equal footing with the purchase of additional kilowatt hours or kilowatts.

Today, our procurement practice is simply to buy additional kilowatt hours and kilowatts. Yet the same resources that are used to buy more and more expensive power could be used to purchase **reduced power use** through efficiency and demand reduction. In a governance sense, we are blind to the possibility that the only real and cost-effective path to "reliable, affordable and clean" is through increased efficiency - from generation through transmission and distribution to end-use consumption. The fact that - based on the expert analysis in this report and a multitude of others - a redefinition of the procurement process would begin to save customers money, improve system efficiency and reduce our environmental impact - is currently not considered within the current governance practice. Until we redefine "procurement" to explicitly incorporate this concept - to allow for the investment of "procurement dollars" in tools, technologies and customer behavior that will lower our demand and improve our efficiency, we will make little or no progress towards achieving "affordable, reliable and clean".

Thankfully, in Illinois, we have a new institutional framework with sufficient existing funding that could quickly develop the requisite cost-benefit analysis of the choices outlined above. The Illinois Power Agency, created in statute last year, has the money and the authority to do this work. With supportive executive leadership its efforts could be expanded to accomplish this mission.

2. Give customers real choice

In Illinois we have talked about customer choice since the early 1990's. As envisioned by

the proponents of retail competition in the electricity marketplace, customer choice was supposed to bring new competitors, new technologies and new opportunities to reduce costs to Illinois consumers. For large industrial and commercial customers, this has largely been accomplished. By the end of 2007, nearly 100% of the industrial load and nearly 50% of the commercial load were supplied by neither Ameren-Illinois nor ComEd, but by independent retail providers. When the numbers are available for 2008, they are expected to significantly increase, particularly for the commercial class.

But retail choice - as defined in the 1997 law - has been an abject failure for small customers. At the end of 2007 zero percent of small retail customers were served by retail providers. As of 2008, virtually all of small customer electricity was purchased through plans devised by the Illinois Power Agency and by the end of 2009, all of the mass market electricity will be purchased through plans devised by the IPA.

Given the structure of the power purchases of the IPA, it is unlikely that we will see any increase in retail competition as defined in the 1997 law for small customers. But that does not mean that the benefits of choice should be denied them. And those benefits are very real. As the report aptly demonstrates, by providing customers with a range of voluntary smart rates that allow them to choose how much and when they want to consume and matching that with the digital technology a smart grid would provide, consumers can capture the bulk of the benefits that retail competition would have provided. In addition, this smart rate structure will create the necessary market incentives for a competitive entrepreneurial smart service market in which consumers can choose the most user-friendly innovation to transform the efficiency and quality of their electricity use based on enabling electricity "prices to devices". Finally, enabling new options such as community based aggregation and the aggregation of meters in multi-tenant buildings could provide additional consumer value.

3. Educate consumers

Capturing these benefits, however, is dependent on smart consumers. Without informed and empowered consumers, the likelihood of achieving "reliable, affordable and clean" is close to zero. Electricity service until now has had little in it for the smart consumer. For the most part, consumers have not been given the information or the frameworks to be anything other than passive players in the electricity marketplace. While consumers make choices about appliance purchases and lifestyle choices, they have not been able to use information about energy use to tune their consumption to the best balance of economy and comfort. In the same way as phone plans have changed over time and consumers have responded by changing how they use telecommunications, the right combination of smart offerings (smart technologies and smart rates) can enable smart consumers to make choices that minimize their costs and maximize their benefits. Even before new technologies are deployed, it's essential to establish a priority on substantive, ongoing consumer education and on who will be responsible for its implementation.

Conclusion

The recommendations outlined above present a real opportunity for Illinois, and the time is now to act. The newly formed Illinois Statewide Smart Grid Collaborative, created by the Illinois Commerce Commission, provides an important venue for action. Combined with a growing national interest in the smart grid, exemplified by the significant funding now proposed in the Federal Stimulus package, work in Illinois must move forward to adopt the best smart grid policies that bring benefits home to consumers While significant hurdles remain to be worked out, the potential benefits for consumers, for utilities, for society and for the environment all argue for action. It is the hope of the Center for Neighborhood Technology and of many ISGI participants that this report and the work of the Initiative will provide a framework for that action.

INTRODUCTION AND SUMMARY: TOWARD A SMART ENERGY FUTURE FOR ILLINOIS CONSUMERS

The Illinois Smart Grid Initiative

During the past several years, the idea of *green energy* and the need for greater energy efficiency – whether to protect the environment, secure energy independence or to save money – have begun to take hold in Illinois and indeed across the nation. Millions of people are taking action to reduce energy consumption, and millions more want to learn how to do it in a way they can understand and afford. Both of the major party Presidential candidates promised a green energy future during the 2008 campaign, and President Obama has since made green recovery and green jobs as part of his economic stimulus plan. The recently passed *American Recovery and Reinvestment Acts* include over $4.5 billion for smart grid related investments.

At the same time that green energy consciousness has been growing, the idea of *modernizing* the electricity grid as part of that future has received increasing attention in the U.S. and abroad. When the U.S. Congress enacted the *Energy Independence and Security Act of 2007*, it included a new Title to establish a smart grid as a national goal. The smart grid concept, as defined by Congress and the many others who have worked to develop it, combines new information technologies with the traditional electric power infrastructure to improve utility operations and to extend greater control to customers. Additional information about conditions on the grid, including customer information, can allow utility service to become more reliable and efficient; and information in the hands of consumers can enable savings on energy bills and choices that protect the environment.

Yet, despite these changes, a shared understanding, particularly among consumers, of how we will transform our energy economy is still in a nascent stage. And, the smart grid concept as a tool in the transformation of the energy economy has only recently left the domain of engineers in search of a broader audience. New political and community leadership will be necessary to create a vision for a sustainable, reliable, and efficient energy future that can begin to address environmental challenges through the introduction of new technology. And practical, local action – by utilities and their customers – will be needed to achieve it.

The Center for Neighborhood Technology (CNT) undertook the ***Illinois Smart Grid Initiative (ISGI)*** in 2008 with support from the Galvin Electricity Initiative and assistance from the United States Department of Energy Smart Grid Team. CNT saw the ISGI as an opportunity to transform the work of these and other organizations into a real-world, consumer-focused dialog with the potential to enhance thinking about the future of Illinois' electric power system.

The Illinois Smart Grid Initiative had two primary objectives: (1) to engage Illinoisans in examining the nature and potential benefits of the *smart grid* for consumers; and (2) to identify policies for achieving those benefits. These objectives were premised on the views that electric power systems must undergo major changes in the coming years to support a sustainable, reliable, and efficient green energy future, that smart grid technologies may have the potential to transform the product and service value propositions available to consumers, and that change in this extensively regulated arena will require rethinking public policies in a way that maximizes consumer value and integrates the values and viewpoints of a wide diversity of interests. In designing this Initiative, CNT paid particular attention to advancing the broadest possible range of stakeholder perspectives, and especially consumer interests and points of view.

To achieve the first objective, invitations to participate in the Initiative were widely distributed; and over 125 people attended four ISGI meetings held between June and November. (A roster of participants appears as an Appendix to this report.) To support understanding of the smart grid concept and stakeholder identification of critical policy issues, extensive briefing materials and independent expert advisers guided policy discussions. The dates and subjects of meetings and all materials presented at ISGI meetings can be found on the ISGI web site: *www.ilsmartgrid.org*.

Various processes were used during and between ISGI meetings intended to encourage and allow maximum participation by stakeholders. At initial meetings, question sessions following expert presentations encouraged question-and-answer among participants; and small group break-out discussions helped to shape understanding of potential consumer benefits of grid modernization. At the final ISGI meeting, subject matter experts facilitated the more extensive small group discussions of policy topics that were later reviewed in a plenary session of the group. A web-based forum was created at the mid-point of the six-month process to collect the views of participants on public policy issues related to smart grid deployment; and contributions to the forum were summarized and distributed to participants. A web site was used to keep a complete record of all ISGI meetings as well as help participants find additional resources.

Smart grid deployment will be a complex, multi-year endeavor. Among utilities throughout the country that have started the deployment process, the focus of investment has ranged from the specific benefits that can be achieved solely from optimizing utility operations to a broader set of societal benefits including enabling customers to fully benefit from, and participate in, energy markets. The ISGI was created to explore how consumer interests can be most effectively taken into account in the discussion of the deployment of smart grid technologies and policies with this broad and diverse perspective.

During the course of the ISGI's meetings, the Illinois Commerce Commission ordered the initiation of a workshop to test (ComEd) and collaborative process to plan (ComEd and Ameren) grid modernizations in Illinois. The former workshop began in December; and the latter collaborative will start early in 2009. The ICC's orders initiating these processes will provide the primary guidance, and also create the necessary public forums, for continued smart grid policy considerations in Illinois. One objective of the ISGI, and this report, is to provide consistent, verifiable information, guidance and analysis that will be useful inputs into these two policy processes.

The next part of this Introduction and Summary briefly reviews the potential consumer, utility, and societal benefits of electric grid modernization. The succeeding part presents six policy topics examined in ISGI meetings that deserve further consideration in the workshops ordered by the ICC.

What are the Potential Benefits of a Smart Grid?

The Illinois electric power system, like systems throughout the world, faces major challenges to meet the changing needs of consumers in the 21st century. While modern information technologies have transformed much of the economy, the electric industry - and in particular the distribution portion of the value chain - have not yet embraced and implemented these technologies. "Smart grid" is a term that refers to the modernization of the electric system through the integration of new information-age technologies, new strategic public policies, and new market processes. Smart grid technologies, business models and policies allow for new

uses of the electric grid, both in operations and through new customer side applications, which extract the benefits of more efficient operation, more efficient use of grid assets, and more cost-effective expansion of the electric grid. The operational and economic benefits of smart grid investments all derive from one fundamental change – smart grid investments transform the electric power network from a passive physical network of equipment into an active, dynamic, *transactive* network that brings together economic actors with diverse preferences, enabling them to exchange for mutual benefit. A transactive network empowers the different actors (including generators, utilities, grid operators, vendors, retailers, and consumers) to make more efficient electricity production and consumption decisions based on assessments of the net benefits of each transaction. This transactive capability creates economic value through enabling more reliability, better security, better individual information, and, in turn, better decision-making and control over electricity consumption.

A smart grid can create benefits through:

- **Improvements in grid reliability** by reducing the frequency and duration of power outages and the number of power quality disturbances, including reducing the probability of regional blackouts.

- **Improved security and safety** by reducing the vulnerability of the grid to unexpected hazards and promoting a safer system for both workers and the general public.

- **Reductions in the relative cost of electricity** through the interaction of the demand side of the market (consumers) with the supply side (suppliers) and the integration of wholesale power markets and retail consumers and suppliers. The smart grid may also hold down prices through more efficient grid operations.

- **Enabling new products and services** to give consumers greater choice and flexibility in energy consumption and to create value for end users.

- **Improved operational efficiencies** for grid operators. Smart grids help grid operators optimize the use of the grid assets and increase the efficiency of the system, leading to lower expenses and potentially avoiding or delaying new capital expenditures. Reducing operating expenses and investment costs can also keep downward pressure on electricity prices.

- **Improved environmental quality** by enabling easier integration of cleaner, lower-carbon-emitting generation at scale, creating information transparency, awareness, and market signals to allow consumers to modify their demand patterns, and allowing access to more environmentally-friendly central station generation as well as clean or renewable distributed generation. A reduction in system losses can also reduce the total amount of generation required.

Various stakeholders may benefit from the smart grid in different ways:

- **Residential and Small Commercial Customers:** Mass market customers can benefit from greater individual control over their energy use and monthly bills by using smart grid technologies and the options, information and controls they provide. By connecting prices and quantity of usage, customers will be transformed from passive "ratepayers" to

active, engaged participants exercising choice in electricity markets. These customers can also benefit from new products and services, including those that create environmental benefits by helping customers manage the "green-grey mix" in the fuels used to generate the electricity they consume.

- **Low Income Customers, Customers on Fixed Incomes, and the Elderly:** Elderly people are most at risk from extreme heat and cold when power is lost. A more reliable grid will limit the risk and duration of outages and accelerate the restoration of service. In addition, by helping to reduce the need for costly new generation, transmission, and distribution facilities a smart grid can help relieve upward pressure on prices to the benefit of families on low or fixed incomes. Finally, new information technology-enabled products and services can bundle valuable functions such as home health care monitoring with electricity service, enabling vulnerable customers to live more independently in situations where they might otherwise not be able to, relative to today's electricity technology and retail markets.

- **Large Customers:** Large commercial and industrial customers require access to information, including price signals, to make efficient energy decisions. As they represent a significant, but only partial, share of the overall demand for electricity, broad availability of price transparency and demand response to small commercial/industrial and residential customers also is in their interest of large customers as it can help control peak power prices and improve reliability for everyone. A smart grid will provide additional benefits from more detailed information, better reliability and enhanced power quality. To the extent that improved reliability attracts or retains businesses and jobs in Illinois, large customers will benefit from avoided relocation costs and growth in the local economy, and these benefits will flow through to consumers who purchase products created by these large customers.

- **Local Governments:** Local governments can benefit from higher reliability and lower outage duration through reduced burdens on local fire, police and other city resources that must help with such events. Greater information and control over the distribution system will also allow grid operators to assist with emergency situations, such as fires and storms, by turning off power to individual customers or small areas, or by restoring power faster and more efficiently, particularly for those customers who depend on electricity for life support. Local governments are also consumers of electricity and can take advantage of the consumer-related benefits of smart grids, to the benefit of residents and taxpayers.

- **Utility/Grid Operators:** Grid operators will benefit from direct cost reductions, enhanced system reliability, and higher customer satisfaction. Direct cost reductions can come in the form of lower meter reading and servicing costs; avoided meter capital costs on existing meters; more efficient deployment of field staff as a result of better information on grid conditions; labor and non-labor operations cost savings; increased utilization of existing facilities; and improvement in efficiency of billing, customer connections, and other utility processes. Other benefits include reductions in working capital needs, reduction in bad debt expense, reduction in theft and energy losses, improved and more efficient customer service, more efficient planning and maintenance of the system, and more efficient use of back office resources.

- **State and Local Economies:** These economies can benefit from increasing the reliability of the power system, creating a modern infrastructure for 21st century commerce and attracting or retaining new and innovative businesses that create new jobs and income.

In particular, the access to superior levels of power quality can be a magnet that attracts new high tech industries. To the extent that they produce new functionality, products, and services that create substantial consumer benefit, these new jobs will contribute to new value creation in the economy.

Key Policy Considerations for Smart Grid Deployment

Decisions to create a smart grid require different planning processes and considerations than decisions about traditional utility capital investments. **Smart grid planning** is critical for understanding and articulating a clear vision for the features a smart grid might provide and for evaluation of the smart grid deployment process, including how the investments will be paid for. Smart grid planning involves a broader set of issues and needs to include a broader set of participants than traditional utility planning as more participants and their behavior will need to be considered.

At least six policy aspects of the planning process should be considered when moving forward:

1. **Maximum Participation:** Participation in the smart grid planning process by the widest group of stakeholders possible is critical to obtain the necessary commitment and to provide the necessary input into smart grid design and functionality. The breadth and variety of potential benefits from smart grid investments means that many stakeholders will feel the effects of the smart grid policy decisions made in Illinois and at the federal level, and widespread stakeholder participation in shaping forward-looking smart grid policy will help ensure that consumer interests are integrated into the planning and the system deployed.

2. **Smart Grid Definition:** A stakeholder-driven definition will help provide the common vision for the smart grid and help in understanding the necessary planning steps in deploying smart grid by representing the diverse preferences of the various groups of individuals who may benefit from smart grid investments.

3. **Smart Grid Drivers:** Decisions to deploy smart grid technology should be driven not only by technological capabilities, but also the public pressure, through regulatory and legislative means, to improve the ability of utilities to provide more reliable service and for customers to take more control over their energy consumption. It should also be driven by its potential to enable entrepreneurs to bring more innovative products and services to retail customers, especially small residential and commercial customers who currently have few opportunities and choices in the current regulatory environment. The degree of regulatory and utility managerial leadership will also help drive the degree to which smart grid is deployed, as well as its timing.

4. **Business Case:** The business case evaluates the costs and benefits of investing and deploying smart grid technologies. While the business case must include the traditional approach to utility cost and benefits, the nature of the smart grid and its costs and opportunities requires the business case to include an understanding of the external and societal benefits of smart grid investment (e.g., demand response, conservation, reliability, pollution reduction, etc.), and how those benefits can be most effectively realized by consumers, communities and utilities.

5. **Standards:** Standards for communications and information flow to and from the grid is of critical importance. Interoperability, or the ability of parties to exchange information across

different types of technologies or across business boundaries, will be a critical component of creating the benefits that are possible through smart grid investments. Interoperability necessitates common, shared understandings of the information content and meaning in data flowing across those boundaries. For that reason, various industry parties and stakeholder groups are working to create a set of shared interoperability industry standards for the wide variety of transactions in the electricity value chain. Illinois will need to be aware of, and participate in, the national efforts to define these standards as well as incorporate standards into the planning and deployment of smart grid technology.

6. **Metrics:** The purpose of metrics is to identify performance expectations such as reliability metrics, cost metrics, and carbon metrics. Metrics provide specific measurable improvement targets which will demonstrate performance milestones for smart grid deployment. Metrics can help provide,regulators, stakeholders, and investors with clear criteria for measuring the effectiveness of smart gird polices, designs, and plans.

Evaluation of Smart Grid Investments from a Societal Perspective

Smart grid investments will enable consumers to benefit from changes in their behavior, from new products and services, and from new ways of pricing electricity. However, traditional utility investment criteria customarily have not considered "external benefits" like these; and consequently the justifications for smart grid investments may be unreasonably narrow. The Illinois Commerce Commission has recognized this potential dilemma by directing stakeholders to consider "methods of estimating, calculating and assessing benefits and costs, including evaluation of non-quantifiable benefits (and costs)."

Alternative Methods of Ratemaking for Smart Grid Investment

There are a number of ways in which smart grid investments are very different from traditional utility investments and the traditional ratemaking methods may not enable decisions that best serve the public interest. There are additional consumer benefits that can be enabled by smart grid investments, though these may be difficult to quantify precisely or to guarantee. There is risk of obsolescence of investment in technology as well as the possibility of displacing assets that are currently on a utility's books. Traditional ratemaking processes are not conducive to considering these factors and alternative forms of ratemaking may be appropriate and necessary to deploy smart grid technology.

Non-utility Investment in the Electric Grid

Distribution utilities are charged with investing in the electric grid and managing the operations of the grid. However, smart grid operations may present opportunities for non-utility parties to invest, to the benefit of themselves and others. These investments might include micro grids, advanced metering, and other investments designed to increase reliability, reduce costs, or otherwise benefit a local area. While in aggregate smart grid investment does require coordination and planning to deliver benefits cost-effectively, that planning does not require that all smart grid investments must be made by utilities and paid for by ratepayers, and the regulatory environment should not deter willing non-utility parties from making those cost-effective investments.

Modification of Default Service Pricing

Today's flat rate default electric service pricing for mass-market customers (residential and small commercial), reinforced by aggregate long-term wholesale procurement contracts, promotes inefficient consumption and limits opportunities for customers to economize their own electricity purchases. It also deters competitive retail suppliers from entering the market

to serve those customers, depriving mass market customers of the opportunity to choose from among competing options as they do in most other consumption decisions they make regularly. In the longer run flat rate pricing may also inhibit the introduction of innovative products and services (e.g., demand response products, distributed energy resources, plug-in electric hybrids, etc.). A smart grid, and in particular smart meters, make measurement of the consumption of electricity far more precise, and therefore enable a wide range of changes to electricity pricing. Rate offerings can take advantage of that opportunity to provide meaningful choice to consumers. To realize the benefits to customers and ratepayers as a whole, it may be desirable to consider modifying the default rate to reflect the changing cost of electricity production, to modify the way wholesale procurement is implemented so that it does not act as a barrier to consumer choice, or to encourage customers to choose time-of-use rates that are linked to the actual wholesale price of electricity.

Effect of Statutory Renewable Resource, Demand Response and Energy Efficiency Goals on Smart Grid Planning and Implementation

Smart grid investments may enable greater integration of renewable sources of energy, may increase aggregate and individual customer demand response, and may promote energy efficiency. Existing Illinois laws establish targets for energy efficiency, demand response, and renewable energy procurement. The Commission has recognized that these existing laws may have an "effect on smart grid planning and implementation." This issue also intersects with the aforementioned recognition of the importance of incorporating "external benefits" into the benefit-cost analyses performed in the process of creating business cases for smart grid investments.