



PJM 2013 ANNUAL REPORT **BUILDING RESILIENCE**

09:54:51






BOARD OF MANAGERS	6	STRENGTHENING MARKETS AND RELIABILITY	18
BOARD LETTER	8	PLANNING FOR THE FUTURE GRID	20
EXECUTIVE TEAM	10	IMPROVING GAS/ELECTRIC COORDINATION	22
RELIABILITY AND RESILIENCE	12	SEEING THE BIG PICTURE	24
ADAPTING TO A NEW WORLD	14		

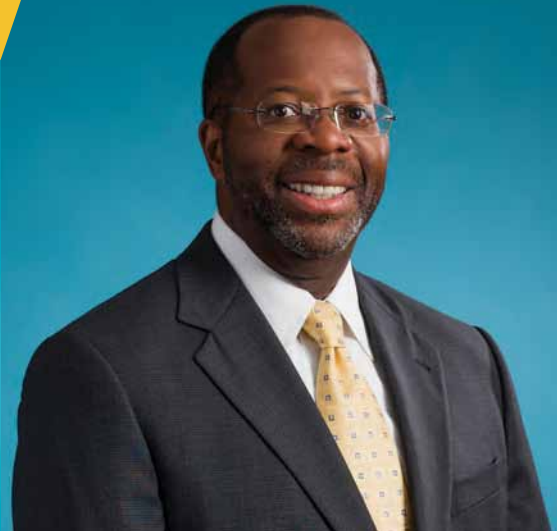
“Resilience is the ability to reduce the magnitude and/or duration of disruptive events.”

- Terry Boston, PJM President and CEO



READY FOR THE WORST CASE	26
ENHANCING PERFECT DISPATCH	27
GROWING COLLABORATION	28
PJM AT A GLANCE	30

PJM 2013 ANNUAL REPORT



HOWARD SCHNEIDER, J.D.
CHAIR, PJM BOARD

TERRY BOSTON

SUSAN J. RILEY

CHARLES ROBINSON

2013 PJM Board of Managers

JOHN MCNEELY “NEEL” FOSTER

AKE ALMGREN, PH.D.
VICE CHAIR, PJM BOARD

JEAN D. KINSEY, PH.D.

WILLIAM R. MAYBEN

SARAH S. ROGERS

RICHARD T. LAHEY, JR., PH.D.

Letter from the Board Chair and President & CEO

To Our Stakeholders:

PJM Interconnection and our members work together to ensure continuous electricity flows for 61 million people in 13 states and the District of Columbia. Our paramount focus is reliability, as we strive – every second of every day – to balance supply and demand, manage weather impacts and perfect generation dispatch for North America's largest transmission system.

Over a longer perspective, the PJM transmission system is a central point where the national impacts of economic forces, regulatory decisions and technological innovation converge. The system is clearly undergoing an extraordinary transition as many coal-fired power plants retire and more natural gas-fired plants are built.

PJM is dealing effectively with this rapid transformation. Our three-year forward capacity market is retaining and attracting resources of all kinds – combined-cycle gas generators, renewable resources, demand response and energy efficiency – that enhance competition and ensure reliability. In 2013, more than 169,000 megawatts were committed for future service, including 5,400 MW of new generation and more than 12,400 MW of demand response.

Complementing the forward capacity market is a regional planning process that identifies improvements to the transmission system that are needed to support this evolving portfolio. After extensive analysis and public review, in 2013 the PJM Board of Managers authorized an additional \$4.6 billion to enhance reliability and modernize the grid.

PJM markets enable change while reinforcing reliability. Transparent prices reflect market fundamentals, which increasingly are driven by the price of natural gas. Market forces are driving efficiencies, sustaining new technologies (including 60 MW of battery storage in service) and accelerating changes in an industry that has long remained stable in its operations.



One of the year's major accomplishments was the board's negotiation and approval of a new contract with Monitoring Analytics to continue independent market-monitoring services through 2019. Continuity of these services, with the board's independent oversight, will ensure integrity of PJM markets for the benefit of all members and the public.

In 2013, PJM processed \$34 billion in gross billings and continued to grow its membership, which reached 879 at year-end. We earned an unqualified SSAE 16 audit opinion for the 13th consecutive year, and operating costs to members remained under stated rate caps for the eighth consecutive year.

PJM saved our members \$221 million in 2013 by perfect dispatch performance and continues to benchmark as one of the world's most cost-efficient transmission operators. We also continued expansion by successfully integrating East Kentucky Power Cooperative, adding 3,099 MW of capacity and 2,797 miles of transmission lines.

PJM has an absolute commitment to reliability. Increasing the resilience of the system has become an important element of our mission as well. PJM's professionals are focusing on measures that will strengthen the ability of the grid to anticipate, ride through and then recover quickly from a major disruption—whether natural or man-made.

PJM values its members who maintain a robust transmission system and a diverse mix of generating resources. We continually seek new ways to retain existing investments, attract new resources and strengthen fair and efficient markets. Sustaining our electric infrastructure is absolutely crucial to the region's economy and to our nation's success.

A handwritten signature in black ink, appearing to read "Howard Schneider".

Howard Schneider,
PJM Board Chair

A handwritten signature in black ink, appearing to read "Terry Boston".

Terry Boston,
PJM President and CEO

Executive Team

BACK ROW:

MICHAEL J. KORMOS

EXECUTIVE VICE PRESIDENT – OPERATIONS

TERRY BOSTON

PRESIDENT AND CEO

NORA C. SWIMM

VICE PRESIDENT – HR AND CORPORATE CLIENT SERVICES

SUZANNE S. DAUGHERTY

SENIOR VICE PRESIDENT, CFO AND TREASURER

SEATED:

VINCENT P. DUANE

SENIOR VICE PRESIDENT AND GENERAL COUNSEL

ANDREW L. OTT

EXECUTIVE VICE PRESIDENT – MARKETS





Reliability and Resilience

Reliability is the mission and traditional measure of performance for the organizations that operate the nation's electricity grid. PJM Interconnection embraces that mission wholeheartedly.

Reliability means “keeping the lights on” in day-to-day operations and responding quickly and effectively to outages and emergency events that affect transmission and distribution systems.

The nation and region PJM serves count on that commitment to reliability because electricity is the driving force in our digital economy. Our health and welfare and economic well-being depend on a reliable supply of electricity, delivered where and when it's needed at the speed of light.

That is why PJM also is focusing on resilience – the ability to reduce the magnitude and duration of major events that threaten the reliable supply of electricity. We and our members have learned from the extreme weather of recent years, as well as ever-present security risks, that there are threats to the grid's reliability that can't be fully anticipated or prevented.



BUILDING RESILIENCE

NERC AUDITS

The North American Electric Reliability Corporation and regional reliability groups assessed PJM's compliance with reliability and critical infrastructure protection standards in two 2013 audits.

PJM successfully completed both on-site audits and is using the examiners' recommendations as a springboard to evaluate and strengthen its compliance program.

The reliability audit examined PJM's compliance with 29 NERC reliability standards; the critical infrastructure audit examined compliance with eight standards and 40 requirements for physical and cybersecurity.



A RESILIENT GRID has the ability to anticipate, absorb, adapt to and rapidly recover from high-impact disruptions. It can ride through and recover from extreme events.

For PJM and our members, the key to resilience is flexibility, not only in taking steps to “harden” the system against extreme weather, but also in our ability to adjust to dramatic changes in the fuel mix. Flexibility also means empowering newer technologies like energy storage to help solve reliability problems.

From our formation in 1927, PJM has been at the forefront of evolutions in the industry. Our focus on resilience represents the latest example of our commitment to ensuring the reliability of the electricity grid.



Adapting to a New World

Both reliability and resilience hinge on the effectiveness of PJM's operations, markets and infrastructure planning working together to produce a strong grid.

Challenging all aspects of PJM's business is the massive fuel transition under way as many coal-fired power plants retire and natural gas-fired resources become a greater part of the generation mix. While this transition is occurring across the nation, it is taking place especially rapidly in the PJM region.

The changes are playing out in PJM's capacity market, where more than 28,000 MW of new generation has cleared in the past seven years, much of it gas-fired capacity. PJM's capacity market makes this transition efficient while preserving reliability. Natural gas has been challenging coal in PJM's generating mix and

already represents more than 60 percent of the new resources in PJM's generation queues. At year-end 2013, 118 proposed natural gas projects were under study, compared with 73 for wind, 66 for solar and six for coal.

In the last annual capacity auction, for the 2016/2017 delivery year, record amounts of new generation and capacity imports were committed to meet the needs of the PJM region. The auction secured 169,160 MW of capacity resources. They included 5,463 MW of new generation, 7,483 MW of capacity imports, 12,408 MW of demand response and 1,117 MW of energy-efficiency resources.



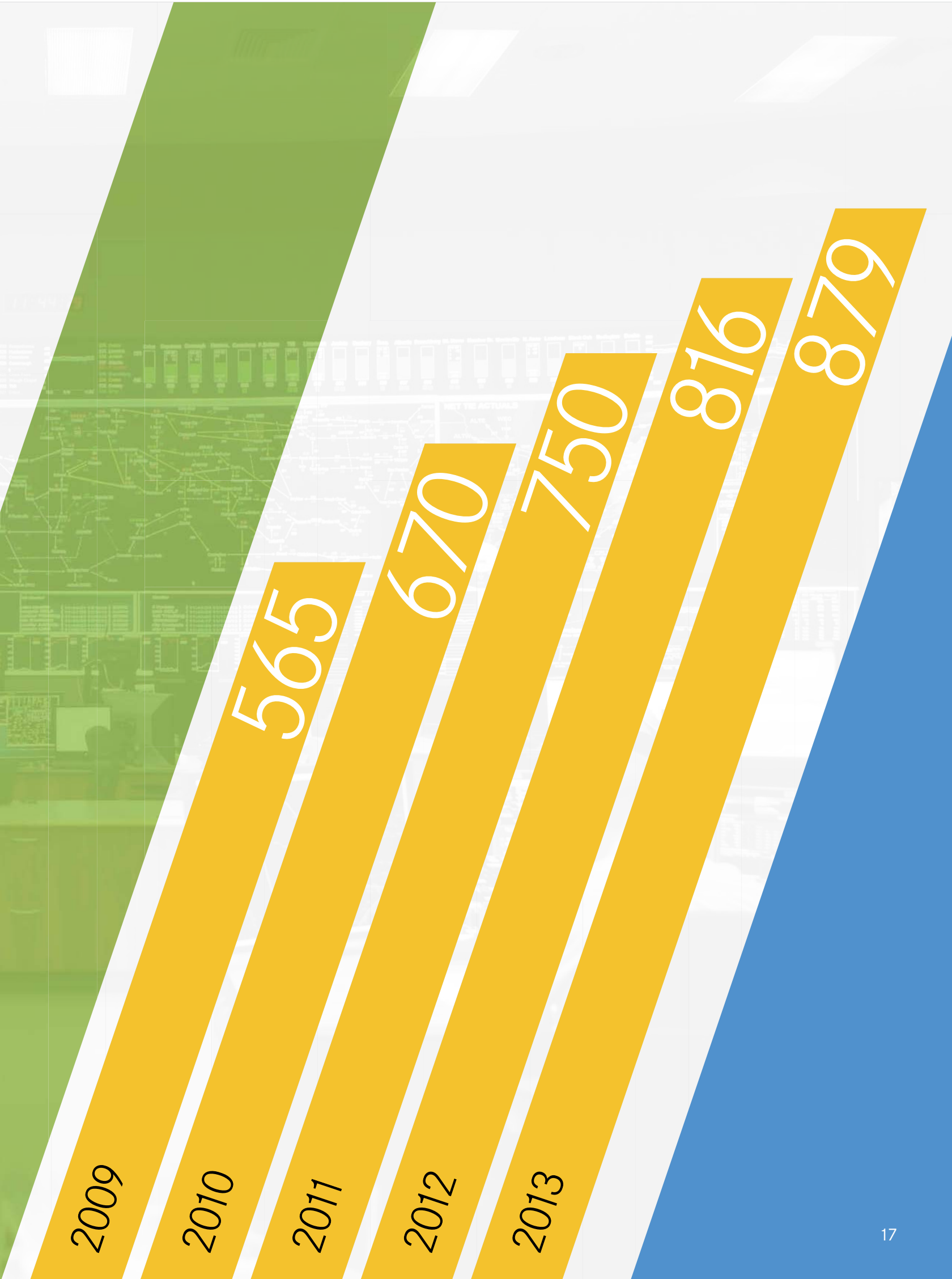
DEMAND RESPONSE highlighted its value in hot-weather situations in July and September, helping to bolster the system by providing needed demand reductions. In particular, demand resources provided more than 5,790 MW on September 11, when abnormally hot weather challenged grid operators in the Midwest and Mid-Atlantic states. This was the largest demand reduction in PJM history.

To enhance the value of demand response throughout the system, PJM has proposed a series of changes in RPM rules to provide more operational diversity and flexibility. PJM and its stakeholders also identified the serious risk that needed imports of power into PJM could be curtailed on other transmission systems. The Federal Energy Regulatory Commission is reviewing proposed changes to minimize this risk.



PJM 10-Year Member Growth







Strengthening Markets and Reliability

Frequency regulation involves making rapid changes to the output of generators to keep pace with small moment-to-moment fluctuations in demand to maintain the desired frequency. Driven by changes in the way frequency regulation service is compensated under FERC Order 755, new types of fast-responding resources began entering the Regulation Market. Earlier PJM pilot projects had successfully demonstrated that the resources could follow “a rapidly changing regulation signal.

PJM added a second fast-moving regulation signal and implemented performance-based regulation in October 2012. Since then, the number of fast-moving resources following the new signal and participating in the Regulation Market has tripled. Included are storage resources such as batteries, flywheels and a group of electric vehicles. In total, the resources represent a combined capability of about 490 MW

Regulation resources are paid for their performance – how quickly and accurately they respond to the signal. This performance-based approach rewards faster and more accurate resources with higher payments, strengthening PJM markets by attracting new resources.

To further strengthen markets and reliability over a wider area, PJM has been cooperating with neighboring grid operators in efforts to improve coordination and resolve seams problems. These efforts are producing positive results.

The New York ISO and PJM culminated several years of effort early in 2013 by implementing market-to-market coordination across the two regions to reduce congestion. The joint management of transmission limits allows the most cost-effective generator in either region to be adjusted to deal with a transmission constraint.

As a result of this coordination, prices have been converging at the seams between the two grid operators over the year. In addition to its efficiency benefits, the coordination also enhances reliability by broadening the pool of resources available to both grid operators.

PJM and the Midcontinent Independent System Operator have been working with their stakeholders to prioritize and develop solutions for a range of issues under their Joint Operating Agreement. These include coordination of day-ahead markets, coordination of transmission and generator outages, optimization of real-time interchange and capacity deliverability.





Planning for the Future Grid

The need for a resilient electricity grid places added emphasis on infrastructure planning role. Not only must reliability standards be met, but the ability to recover quickly from a disaster must also be considered.

The Regional Transmission Expansion Planning process is at the heart of PJM's response to the fuel transition and the impact of generator retirements. This dynamic process operates continuously, evaluating the reliability impacts of new developments and changing conditions with a broad perspective covering the whole PJM region.

In addition to the \$4.7 billion in transmission upgrades approved in 2012 to address the reliability impacts of generation retirements, the PJM Board in 2013 approved an additional \$5.8 billion to address the fuel transition and the need to incorporate improvements to help deal with extreme weather. Included was a \$1.2 billion project in northern New Jersey to strengthen the grid in that area.

All told, the PJM Board has approved transmission additions and upgrades totaling nearly \$29 billion since 1999 to ensure the reliability and vitality of the regional grid.

The collaborative RTEP process heavily involves the states through the Transmission Expansion Advisory Committee and the Independent State Agencies Committee, an independent committee of regulatory and other state agencies that provides PJM with inputs and scenarios for transmission-planning studies on public policy projects.

Two key RTEP projects under way are the rebuilding of the Mt. Storm-Doubs 500-kV line in West Virginia, Maryland and Virginia, and the construction of the new Susquehanna-Roseland 500-kV line in Pennsylvania and New Jersey



BUILDING RESILIENCE

MARKET HEALTH

As PJM markets have grown in number and scope, so too has the complexity of new market rules and software.

To ensure that potential issues with market rules and software are identified and rectified, the Market Health Initiative was established to screen a number of indicators daily to determine if there are anomalies in the markets that need to be examined.

The goal is to manage the challenges of market complexity and the interaction of market rules and software that could have a negative impact on the effectiveness of PJM markets.

THE MT. STORM REBUILD, to be completed in 2014, involves replacing deteriorated tower structures and increasing the line's capacity for moving power across the Allegheny Mountains.

The Susquehanna-Roseland line, to be in service in 2015, will resolve projected reliability violations. Construction is under way after unsuccessful court challenges to the siting of the project.

Following approval from the FERC, PJM began implementing its Order 1000 proposals for providing broader opportunities for transmission development by opening up the process to competitive solicitations.

In a series of solicitation windows open to utilities and independent project developers, PJM received a robust response to its request for transmission solutions for southern New Jersey, as well as for projects to enhance market efficiency in congested areas. PJM was the first grid operator to use this new competitive approach.

Interregional coordination is another important aspect of the Order 1000 provisions. For example, PJM and MISO, as part of their interregional planning process, received and are evaluating more than 75 transmission project proposals designed to relieve congestion on their seams.

Various interregional studies are being conducted with MISO, the North Carolina Transmission Planning Collaborative, the New York ISO and ISO-New England, in addition to the work being done by the Eastern Interconnection Planning Collaborative on the integration of renewables and gas/electric coordination. All of these efforts will benefit the reliability and resilience of the Eastern Interconnection.

PJM's role expanded on June 1 when it began managing East Kentucky Power Cooperative's transmission system and open, competitive wholesale electricity markets in that area.

With 3,099 MW of generating capacity and 2,797 miles of transmission lines, EKPC provides wholesale electricity to 16 electric cooperatives serving 520,000 Kentucky consumers. The integration provides PJM with diverse resources that will support reliability while helping EKPC operate more efficiently and economically with access to PJM markets.





Improving Gas/Electric Coordination

The growth of natural gas as a generating fuel nationally has raised concerns about the reliability implications for the electricity grid if the fuel can't be delivered to power plants, especially during weather extremes. PJM and other grid operators, along with the gas industry and regulatory agencies, are carefully examining the gas/electric interface to identify issues and develop solutions.

As part of PJM's stakeholder process, a senior task force was formed to focus on the gas/electric interface. Issues being examined include the differences in timing commitments in PJM markets versus natural gas markets and fuel cost recovery in PJM markets.

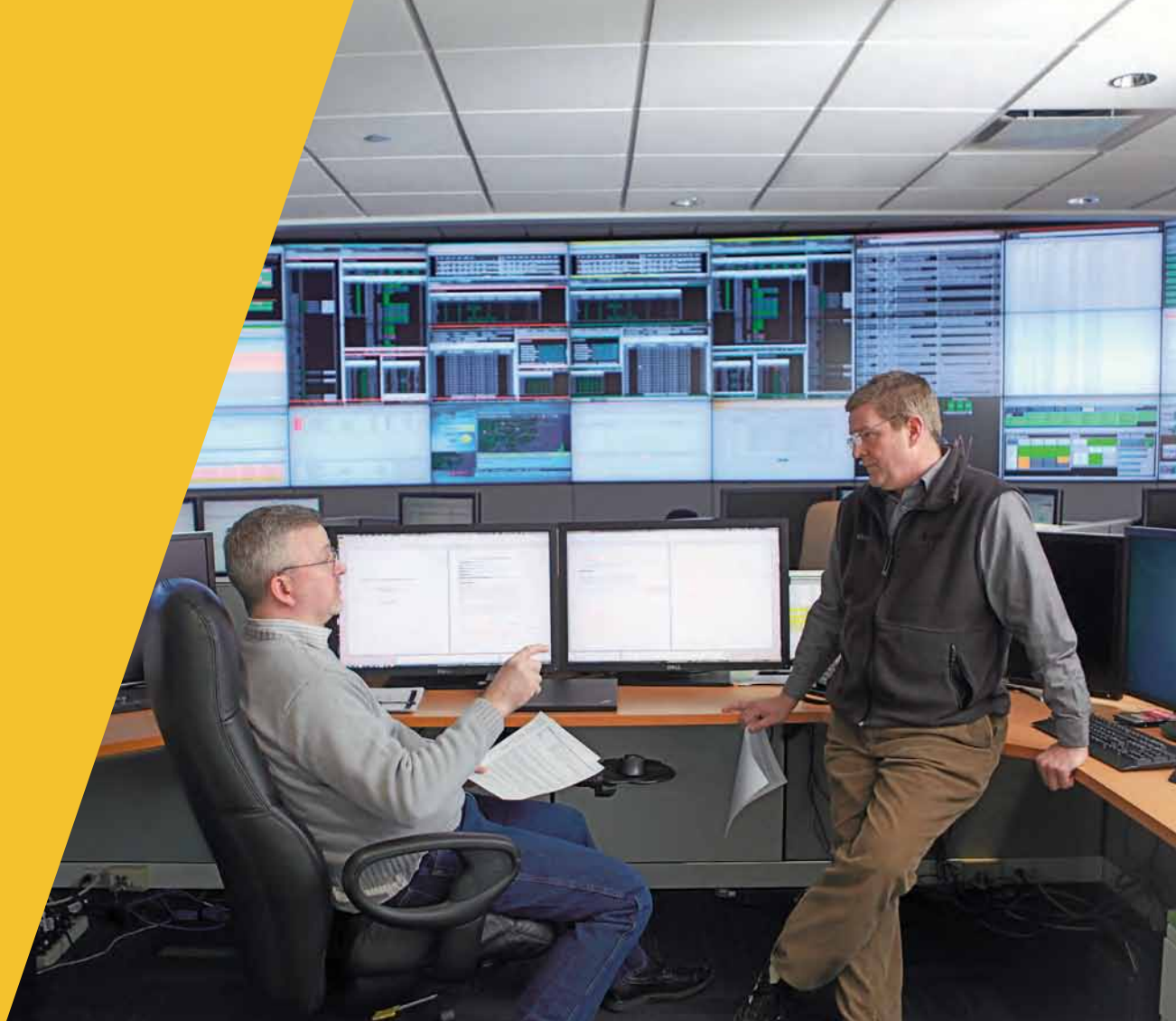
In a major initiative with Department of Energy funding, six grid operators partnered to analyze the natural gas infrastructure serving a large portion of the Eastern Interconnection. They are PJM, the Midcontinent ISO, ISO-New England, the New York ISO, the Tennessee Valley Authority and the Ontario Independent Electricity System Operator.

The study is being coordinated by the Eastern Interconnection Planning Collaborative, the umbrella organization for electric grid planning activities in the Eastern Interconnection.



The study, which is to be completed by mid-2015, will develop a baseline of the electric and natural gas systems, including their planning, operation and interactions. The results will be valuable in helping to improve gas/electric coordination in support of the goal of ensuring system reliability and resilience.





Seeing the Big Picture

In August 2013, the electricity industry marked the 10th anniversary of a defining event – the Northeast-Midwest blackout. That major interruption, which originated in Ohio and had only minimal impacts on PJM, affected about 50 million people and caused financial losses estimated at up to \$10 billion.

Much has changed at PJM and across the industry since then. The lessons of the blackout have been applied, prominent among them the need to see and understand the system's condition, status and limits over a broad area.

To address this key lesson from the 2003 blackout, the industry is deploying thousands of synchrophasors nationally to provide wide-area monitoring and early warnings of grid instabilities, supported in part by matching Smart Grid funds from the Department of Energy.

PJM's member transmission owners have gone well beyond the original plan, dramatically expanding the number of devices to be installed and the number of substations equipped with them. When the installations are completed, there will be more than 400 synchrophasor devices in more than 100 substations across the PJM region; at the end of 2013, 319 devices at 86 substations were reporting data.



BUILDING RESILIENCE

PJM PASSES SSAE 16 AUDIT

PJM's market settlement billing controls passed the Statement on Standards for Attestation Engagements 16 Type II audit (formerly known as SAS 70).

PricewaterhouseCoopers conducted the SSAE 16 audit, which covered the 12-month period from Oct. 1, 2012, through Sept. 30, 2013. The unqualified opinion covered controls related to PJM's market settlement processes, as well as the information technology infrastructure that supports PJM's markets.

In keeping with governance rules, such as those in the Sarbanes-Oxley Act of 2002, a SSAE 16 report is designed to provide an understanding of a service organization's internal controls to the auditors of the companies that use the organization's services.



THE ADVANCED GRID-MONITORING DEVICES, also known as phasor measurement units, enhance reliability by enabling grid operators to collect and analyze data at a much higher frequency. Readings are taken 30 times a second and time-stamped; the data from different locations can be synchronized to create a detailed view of the broader system.

The phasor measurements can show system changes that would not be evident with conventional methods. The level of detail and precision available to control room operators with the phasor technology is akin to a doctor's ability to diagnose a patient with an MRI instead of an X-ray.

Processing of the vast amounts of data from the 319 phasor measurement units in service requires new analytical tools, as well as system operators' gaining experience with the data and tools.

With its scalability and open architecture, PJM's Advanced Control Center Project continued to deliver results for PJM's members in its second year of service, including a 100 percent uptime record – two years without an outage – for key components and related security functions.

The advanced technology systems of AC² represent the most modern, secure technology platform for managing the grid and electricity markets. Its two fully functional control rooms and data centers, each one capable of managing the system on its own, provide an additional level of resilience and security to the system.



Ready for the Worst Case

While advanced technology like synchrophasors can rapidly identify changes in system conditions and help operators diagnose grid problems, PJM and its members also must be prepared to deal with extreme storms and other unavoidable threats to the grid.

Part of that responsibility includes implementing systematic plans to restore the grid in the event of a major disruption, using what's known as black start service to begin the restoration process. Black start generating units can start up without an outside source of power and deliver electricity to the grid to enable other plants to return to service. These resources are critical to grid resilience because they provide the initial power to the transmission system to “bootstrap” other generators.

Recognizing that many of its existing coal-fired black-start generators will be retiring, PJM and its members devised a new system restoration strategy to ensure that an adequate and optimum mix of resources will be available if needed in a grid shutdown.

More than 50 generators responded to PJM's request for proposals that meet the new black-start criteria. After evaluating the proposals, PJM may make selections based on the capability, location and costs of units to determine the most effective solutions to ensure the ability to restart the grid.

In the wake of a few controlled power interruptions that were required in September as a result of abnormally hot weather, PJM prepared and issued a detailed technical analysis of the events, along with a review of market impacts. The analysis included a series of recommendations based on the lessons learned in areas such as system modeling, PJM and member dispatcher training, technology changes, process improvements, notifications and communications protocols.



Enhancing Perfect Dispatch

The continuing success of PJM's Perfect Dispatch initiative exemplifies the work being done to continually refine and improve PJM's dispatch performance. Perfect Dispatch measures the actual daily scheduling of generation resources against the hypothetical optimum performance.

Savings for 2013 totaled \$221 million, bringing the total savings from Perfect Dispatch to \$842 million since 2008.

By identifying opportunities for improvement, Perfect Dispatch helps PJM enhance how generating resources are used. In addition, enhancing dispatch helps reduce overall emissions, contributing to the declining emissions trendline in PJM.





Growing Collaboration

PJM's membership continues to grow, reflecting both the wide range of opportunities available in the markets as well as its focus on providing cost-effective services.

In 2003, PJM had 250 members; at year-end 2013, membership totaled 879, increasing two and a half times.

PJM recovers its administrative costs – the costs of operating the electric transmission system and the wholesale electric markets – through fixed rates billed to members based on their activity levels. The current rate is scheduled to remain in effect at least through 2016. With effective cost-control and productivity initiatives, PJM manages its costs within the established rate, refunds savings to members and funds a financial reserve.

In benchmarking against other grid operators, PJM continues to be the lowest-cost operator administering markets in the world.

Collaboration is an inherent element of PJM's structure and stakeholder process. And PJM recognizes the value of encouraging dialogue to explore industry issues and developments for the benefit of all in many forums. Sharing lessons learned is an important aspect of being prepared to respond to the unexpected for all those involved in ensuring the resilience and reliability of the grid.

In two forums in its Grid 20/20 series, PJM brought together industry, government and academic experts to discuss and share ideas and best practices on two critical topics: transmission and distribution reliability and resilience.



BUILDING RESILIENCE

CONFERENCE AND TRAINING CENTER

PJM's Conference and Training Center facility, which opened in 2012, has succeeded in achieving the goal of reducing the cost and increasing the efficiency of member meetings.

Holding stakeholder meetings at the facility also has the advantage of having subject matter experts close at hand for consultation when needed.

The CTC was rated highly in the latest member satisfaction survey. It also has received ENERGYSTAR certification from the Environmental Protection Agency for its energy-saving performance.




IN THE INSIGHTS ON ENERGY FLOW forum, panelists discussed advanced technologies for transmission and distribution, distributed generation, energy storage and cyber security.

Reflecting PJM's focus on resilience in response to threats to the electricity system such as extreme weather or cyber attacks, the Grid 20/20 forum in November included panels addressing physical and cyber security, communication and policy and investment. Featured speakers were former Homeland Security Secretary Tom Ridge and FERC Commissioner Cheryl LaFleur.

In 2013 PJM also hosted the annual meeting of GO15, the voluntary organization of 16 of the largest power grid operators in the world. The group issued a declaration supporting expanded grid investment to manage reliability and operational challenges and help build the resilience of power grids across the world.

Part of the GO15 event was a first-ever joint meeting with the Association of Power Exchanges, another international organization that focuses on the development and operation of competitive electricity markets. The collaborative session included discussions on the link between competitive markets and reliability and on managing the evolving fuel mix of supply resources.



Membership	875+
Generating capacity	183,604 MW
Peak demand	165,492 MW
Transmission lines (mi)	62,556

PJM at a Glance

GWh of annual energy	793,679
Annual billings	\$33.8 billion
States served	13 + D.C.
Square miles	243,417
Population	61 million



PJM 2013 ANNUAL REPORT



Working to Perfect the Flow of Energy

For information please contact: **866.400.8980** www.pjm.com
"PJM" is a registered trademark of PJM Interconnection, L.L.C.

