

NEW YORK'S NATURAL GAS AND OIL RESOURCE ENDOWMENT:

PAST, PRESENT AND POTENTIAL



NYSERDA

New York State
Energy Research and
Development Authority

NOTICE

This report was prepared by Advanced Resources International of Arlington, Virginia in the course of performing work contracted for and sponsored by the New York State Energy Research and Development Authority (hereafter “NYSERDA”). The opinions expressed in this report do not necessarily reflect those of NYSERDA or the State of New York, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, NYSERDA, the State of New York, and the contractor make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report. NYSERDA, the State of New York, and the contractor make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no liability for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

ACKNOWLEDGEMENTS

This report would not have been possible without the assistance of key individuals and organizations involved with the natural gas and oil industry in New York. Special thanks to the New York Department of Environmental Conservation, Division of Mineral Resources, Bradley Field, Director, for reviewing the draft report and for providing current State data on natural gas storage, and natural gas and oil leasing, exploration and production. Thanks also to the New York State Museum Reservoir Characterization Group, particularly Richard Nyahay and Langhorne Smith, for providing miscellaneous illustrations and data pertaining to the Trenton-Black River play in New York State, as well as selected historical images, historical data, maps and access to ESOGIS. The Independent Oil and Gas Association of New York shared ideas and helpful suggestions at the outset of this project.

PHOTO CREDITS

Unless otherwise noted below, all photographs of natural gas and oil operations in the State of New York are provided courtesy of the New York Department of Environmental Conservation, Division of Mineral Resources.

Cover:	Seneca County Drill rig, Seneca County, New York, courtesy of John Martin, NYSERDA
Page 3:	Richburg Oil Field, courtesy of Richburg-Wirt Historical Society Museum, Richburg, NY. Available at www.usgennet.org/usa/ny/county/allegany .
Page 7:	Shooting an oil well, courtesy of Richburg-Wirt Historical Society Museum, Richburg, NY. Available at www.usgennet.org/usa/ny/county/allegany .
Page 8:	Barcelona lighthouse, courtesy of Richard Nyahay, New York State Museum
Page 9:	Plaque for Richburg discovery well, courtesy of Ron Taylor, Allegany County, NY; Local History and Genealogy Website. Available at www.usgennet.org/usa/ny/county/allegany . Job Moses #1, courtesy of Richard Nyahay, New York State Museum
Page 10:	Modern New York Oil Field, courtesy of J. Walchli, Nathan Petroleum Corporation Richburg Oil Field circa 1890's, courtesy of Richburg-Wirt Historical Society Museum, Richburg, NY. Available at www.usgennet.org/usa/ny/county/allegany .
Page 23:	Union Springs Formation outcrop, courtesy of Charles Ver Straeten, New York State Museum
Page 25:	Utica Shale outcrop, courtesy of John Martin, NYSERDA
Page 27:	Medina gas well, courtesy of Stripper Well Consortium and Lenape Resources
Page 29:	Geologists, courtesy of Advanced Resources International Oil field, courtesy of J. Walchli, Nathan Petroleum Corporation
Page 31:	3-D seismic image, courtesy of Talisman Energy
Page 35:	Gazebo and pumpjack, courtesy of J. Walchli, Nathan Petroleum Corporation
Page 38:	Oswego Lighthouse, courtesy of NYS DED, D. McGee

CAPTURING THE BENEFITS FROM NEW YORK'S NATURAL GAS AND OIL RESOURCE ENDOWMENT

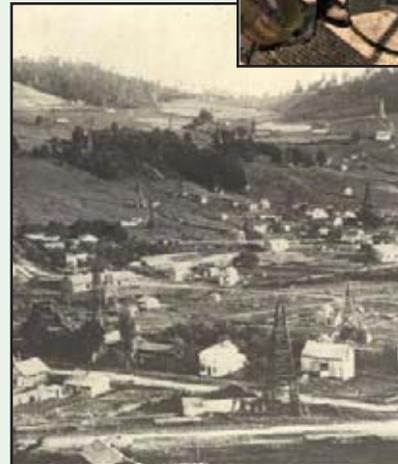
New York has a long history of oil and natural gas development and production. For more than 140 years, New York's oil and gas industry has been driven by foresight, leaps in technology development, perseverance and improved understanding of the State's hydrocarbon resource potential.

A RICH HISTORY

Vision, ingenuity and persistence have been applied to the development of New York's oil and natural gas since the early years and continue to be applied today. In fact, the State of New York is the place of many firsts:

- The first commercial natural gas well, dating back to 1821, was drilled near Fredonia. The first commercial natural gas company was established shortly thereafter.
- In 1830, in the hamlet of Barcelona on Lake Erie, not far from Fredonia, the Barcelona lighthouse became the world's first navigational beacon lighted by natural gas.
- In 1870, a company in Bloomfield bored pine logs and banded them together with iron, creating the industry's first natural gas pipeline, stretching 25 miles to Rochester.
- The New York State Geological Survey, established in 1836, was the first state geological survey and served as an early model for many other state surveys, as well as the United States Geological Survey.

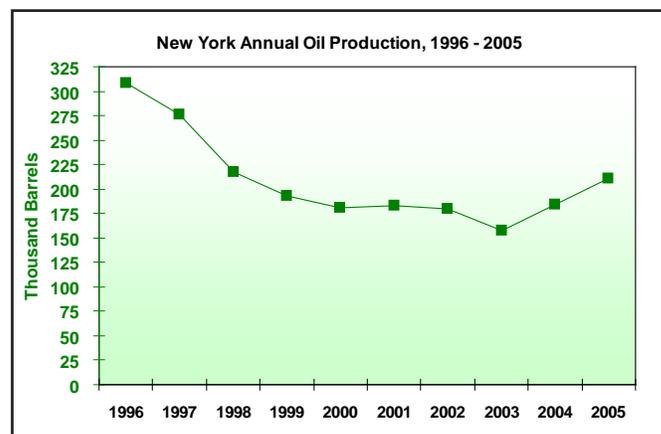
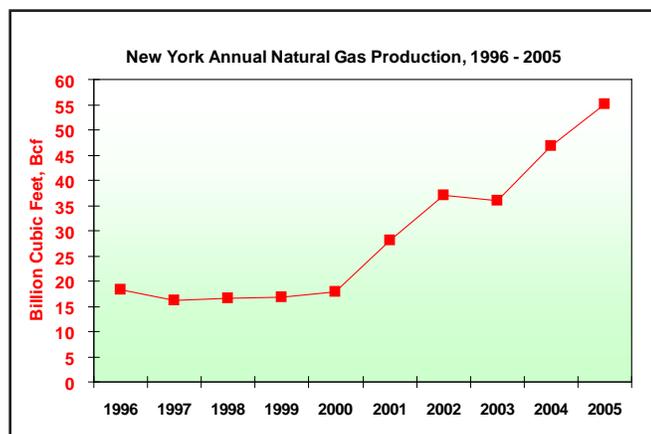
Commercial oil and gas development and production in New York dates back to well before the beginning of the 20th century. New York's first oil well was drilled in Allegany County in 1863, just four years after the famous Drake well in Pennsylvania. New York's oil production reached its peak of 7.3 million barrels of oil in 1882. Natural gas production reached its peak of 55 billion cubic feet in 2005. To date, an estimated 75,000 oil and gas wells have been drilled in New York.



AN EXCITING PRESENT

Despite being one of the most mature natural gas and oil producing areas in the world, New York's future hydrocarbon potential remains bright:

- New York produced 55 billion cubic feet (Bcf) of natural gas in 2005; an 18 percent increase over 2004, exceeding the previous record from 1937. New York's current gas production represents a nearly three-fold increase since the mid 1990s. Natural gas was produced in 21 counties in New York in 2005.



- Annual crude oil production in New York State, although not reaching record production like natural gas, has recently reached levels not seen since the mid-1990s. In 2005, New York produced more than 211,000 barrels, up 15 percent over 2004. Oil is produced in Cattaraugus, Chautauqua, Allegany, Erie, and Steuben Counties.
- The pace of oil and gas drilling in 2005 was four times that of the late 1990s. Drilling in the State is at a 20-year high. More than 8,700 wells were producing oil and natural gas in New York in 2005.

Natural gas and oil production from New York already makes far-reaching contributions to the regional economy, especially in western New York and the Southern Tier — generating jobs, tax revenues, and other benefits to New York citizens.

- According to the U.S. Department of Labor, New York's oil and gas industry directly employs nearly 4,500 people in the areas of exploration and production, pipeline transportation, and refining and gas processing, with 10 times more employed in the wholesale and retail trade of petroleum fuels and the distribution of natural gas.
- In 2005, approximately \$53 million was paid to primarily rural landowners in the form of royalties on oil and gas production, an increase of 27 percent over 2004.
- Local taxes, collected annually on the State's oil and gas production are estimated to be \$13 million, a nearly 10-fold increase over annual tax receipts a decade ago. Since 1996, local governments have collected more than \$44 million in tax revenues from natural gas and oil production, mainly in western New York and the Southern Tier.

- Since 1985, New York has received nearly \$30 million in revenues from natural gas leases on State lands, of which \$26 million were received since 1998. During 2006, natural gas lease sales on State lands produced more than \$9 million in apparent high bids, more than all previous lease sales combined.
- Annual royalty payments to the State from production on State lands have grown by two orders of magnitude since 2002, due to increased production and rising prices for natural gas. New York received royalty revenue of more than \$3 million in both 2005 and 2006.

PROMISING FUTURE POTENTIAL

Prospects for boosting these contributions through increased resource recovery are promising. New York contains significant additional hydrocarbon resource potential that, increasingly, can be produced economically with new technologies. Moreover, the continuation of historically high prices for oil and natural gas will likely drive additional exploration and development and the pursuit of more challenging resources, resulting in further benefits to the State of New York.

Most of the natural gas reservoirs generating renewed interest in New York are challenging; these include "tight" gas sands, gas shales and deep reservoirs. In 2005, six new natural gas fields were discovered in the deep Trenton-Black River formation, four fields in Steuben County, and two fields in Chemung County. Also contributing to the resurgence of natural gas in New York were discoveries in the Oneida-Oswego and Theresa Sandstone reservoirs, and new gas shale discoveries. Despite being one of the most mature hydrocarbon producing areas in the world, substantial resource opportunity remains for New York in new formations, deeper geologic horizons, and in the untapped areas of old fields.

While oil and natural gas opportunities in New York remain bright, interest is growing regarding other subsurface resources in the State, such as geothermal energy, compressed air energy storage in geologic settings, and CO₂ sequestration in geologic formations to address concerns around climate change. The links between these rest on a basic understanding of the State's geology and evolving applications of technologies and practices originally associated with oil and gas exploration and production.

THE CHALLENGES AHEAD

The current pace and scale of natural gas development in New York presents challenges for all stakeholders: private landowners, exploration and production companies, State and local government, and the public, to protect the environment and support the infrastructure and resources of local communities. Consequently, New York State government has the obligation to manage natural resources, protect environmental quality and improve public health while facilitating the flow of benefits from environmentally-sound natural gas and oil development. To accomplish this mandate, the State of New York requires that development proceed with protection of the environment and the public interest as the primary focus.

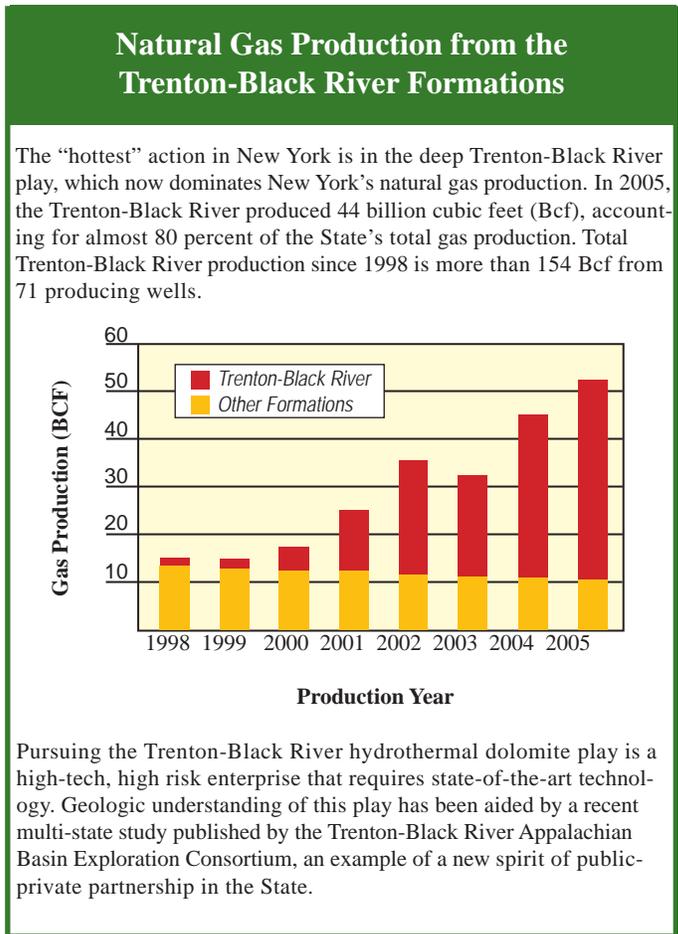
In New York today, the resurgence of natural gas and oil development is facilitated by proactive state agencies that ensure environmentally responsible development and protect the interests of all stakeholders, and by exploration and production companies that engage the community and are responsive to public concerns.

BENEFITING FROM NEW YORK'S HYDROCARBON ENDOWMENT

The future benefits from New York's hydrocarbon resource endowment are promising, but New York's successful realization of these benefits will require continued vigilance and action from both the government and the private sector in key areas:

- Environmental Stewardship**
 State government must continue its strong and responsive regulatory programs to ensure effective protection of the environment and the public interest, incorporating cost-effective regulatory strategies and focused public education and outreach, along with expeditious permitting. Developers must focus on superior environmental performance, effectively addressing landowner and public concerns.

- Technology Progress**
 Advanced technologies and state-of-the-art practices, applicable to the unique characteristics of New York's natural gas and oil resources, must be developed and applied to extend the lives of existing wells and to economically find and produce new drilling prospects. This will require continued public-private partnerships in research, development, and demonstration of new technologies, as well as continued work to better understand the unique characteristics of New York's remaining gas and oil resources.
- Access to High-quality Data**
 Potential developers and investors in the oil and gas sector in New York will require access to high-quality data about the State's resources and production, coupled with effective data analysis and data management. Both government and industry must work collaboratively to ensure that all stakeholders have access to high quality data.



- **Access to Resources**

State policies and programs must continue to:

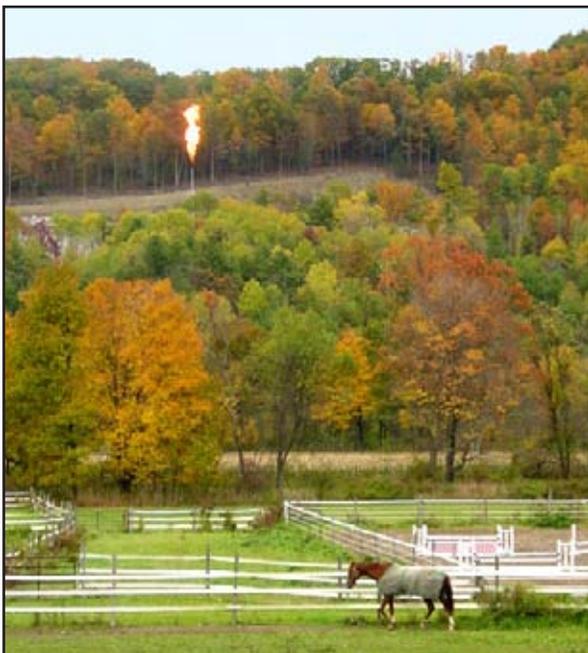
- support access to resources on public and private lands in an environmentally sound manner,
- resolve mineral rights conflicts,
- address unique access issues in urbanized areas, and
- ensure that certain public lands such as State Preserves are permanently off-limits to natural gas and oil development.

Collaborative approaches and state-wide perspectives will be needed to tackle these key areas and accelerate recovery of natural gas and oil in New York. All stakeholders have an interest in the responsible recovery of these resources, not only to help meet the State's energy needs, but also to stimulate economic growth and other benefits. Collaborative public-private strategies will be valuable in leveraging technology to its fullest potential in the region.

While many agencies, organizations, and individuals are interested in oil and gas development, the New York State Department of Environmental Conservation (DEC), particularly its Division of Mineral Resources, plays the lead role in working cooperatively with all stakeholders to achieve its mission of ensuring the environmentally sound, economic development of New York's non-renewable energy and mineral resources for the benefit of current and future generations.



Lower map shows all wells penetrating the Trenton Formation or deeper zones. Upper map shows current Trenton-Black River gas fields in red and all oil and gas wells shown in grey. Maps courtesy of New York State Museum and NY Division of Mineral Resources.



Gas is flared during a test of a newly-drilled Trenton-Black River. During the past decade, annual tax receipts and royalty payments to landowners from natural gas and oil development have increased by ten-fold during the past decade.

Consistent with the theme of New York firsts, the New York State Energy Research and Development Authority (NYSERDA), the first state-chartered public benefit corporation dedicated to state-focused energy research and development and public education, plans to continue its important role in helping New York address the energy and environmental challenges it faces. NYSERDA's support for hydrocarbon exploration and production dates back to its inception in 1975. NYSERDA recognizes the need to continue its work to facilitate the use of innovation and technology to solve some of New York's most difficult energy and environmental problems in ways that improve the State's economy. This will include diversifying and increasing state energy supplies from indigenous resources, including oil and natural gas, and in providing unbiased information to decision-makers, investors, and end-users on the performance and environmental impacts of energy technologies and systems in New York.

Moreover, the continued willingness of the private sector to engage with local communities to address their concerns, along with expanded cooperation with NYSERDA and other State programs will be critical to success. Some future opportunities could require concerted efforts by many industry and government entities. Pursuit of these key strategies will help ensure the energy and environmental future for the State of New York.