



**The New Millennium  
Virginia's Changing Economic Landscape**

**Presented by  
Virginia Tech ARI**



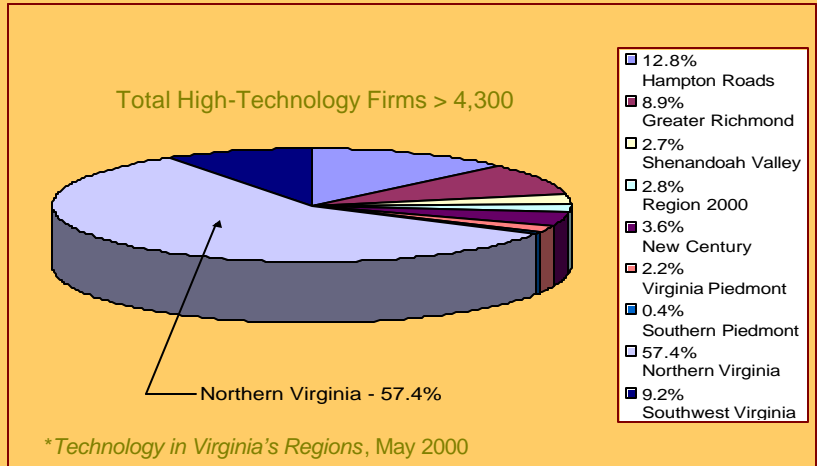
The following presentation was prepared by Dr. Michael Willingham of the Virginia Tech Alexandria Research Institute. The presentation is the first in a series of audio-visual presentations concerning issues linked to the development of the high technology sector in Virginia, with particular emphasis on the possibilities and problems associated with this development. We hope you find the presentation useful, and welcome your comments.

## The New Millennium Virginia's Changing Economic Landscape



This presentation is designed to give a brief overview of key development issues facing Virginia in the new millennium. The presentation focuses on the electrical power sector, critical to development, and one that is being subjected to a rapidly changing dynamic from the growth of high-tech industry, particularly in the computer, communications equipment, and semiconductor manufacturing sectors. Future presentations will examine selected issues in greater detail, and indicate areas where additional research is needed.

## Virginia High Technology Firms\*



Virginia possesses an impressive technology base. As of May 2000, more than forty three hundred high-technology firms were located in the Commonwealth, employing a total of 368,000 people. Although these firms comprised less than 3 percent of the region's businesses, they employed 11 percent of the population and produced almost 20 percent of private-sector earnings.

Almost 60 percent of Virginia's high-tech firms are located in Northern Virginia, which is home to the largest concentration of computer companies in the country. Other major centers include the Hampton Roads and greater Richmond regions.

## Virginia High Tech Industry Dynamic, Energy Reliant

- *Computers, communications equipment, and semiconductor manufacturing*
- *Sector average annual growth rate of 10%*
- *Northern Virginia – Primary focus of venture capital investment*

Virginia's high tech industry, which encompasses the computers, communications equipment, and semiconductor manufacturing sectors, is the most dynamic of all the industrial sectors in Virginia. Between 1992 and 1998, the number of technology firms in Virginia increased an average of 10.2% annually.

This growth has been spurred by the region's ability to attract venture capital. Northern Virginia has led the way for capital investment, receiving almost half of all venture capital expended in the Washington DC metropolitan region.

## **The High Tech Future Virginia's Assets**

- *Highly educated, well-positioned workforce*
- *Backbone for half of world internet traffic*
- *Short-term electricity, gas supply sufficient*
- *Streamlined construction approval process*

Virginia's attraction for high tech industry is based on several key assets:

The more than 14,000 doctoral scientists and engineers living in the Commonwealth provide a human resource pool capable of supporting the rapid growth of high-tech industry

Virginia's extensive fiber optic cable network allow the state to serve as a backbone for half of the world's online internet traffic

The approximately 7,000 megawatts of new generating capacity recently constructed, underway or planned, in combination with adequate short-term gas supplies, ensure that the Commonwealth will be able to meet the energy demands of new industry in the near term

Virginia's streamlined approval process is seen as a plus by high-tech firms requiring accelerated construction deadlines

## Virginia's Electrical Energy From Where? From What?

- *Coal and nuclear power account for 92% of the in-state electricity generation*
- *Virginia imports approximately 20% of total electricity demand*
- *Natural gas - fired generation represents only 3.4% of total utility sales, but*
- *Gas-based generation had 34% annual growth rate between 1988-98*

Virginia's energy economy is based primarily on coal and nuclear power, which together account for over ninety percent of in-state electricity generation. Approximately 20 percent of the state's total electricity consumed is generated from out-of-state sources, making Virginia a net importer of electrical energy.

Although natural gas fuels only a small fraction – just over 3 percent - of the total electricity generation mix to date, its annual growth rate over the past ten years – averaging 34% - is ten times that of the totality of primary fuels.

Almost all new generating facilities in the foreseeable future – both utility-based and merchant plant – are expected to be fueled by natural gas.

## **Energy Supply A Paradigm Shift**

- *Deregulated, competitive energy markets*
- *New fuel supply and contract arrangements*
- *Growth of distributed power systems*
- *Increased power wheeling & cross-border sales*
- *Electricity transmission and natural gas infrastructures*

Although the short-term outlook for electricity availability to service in-state industry is quite favorable, Virginia's longer-term development future is less assured.

Concerns have been raised about the impacts of deregulation in the gas and electrical power sectors, and these concerns are underscored by the current electricity crisis in California.

Uncertainty concerning the impacts of increasingly deregulated, competitive energy supply markets extends to several specific areas, including the evolution of new fuel supply arrangements; the growth of distributed power systems; the impacts of exported, imported and wheeled power; and the upgrading of both electricity transmission and natural gas infrastructures.

## **Servicing High-Tech Industry Meeting New Needs**

- *Traditional 'Three Nines' utility-based power will not suffice*
- *Reliability requirements from Six Nines to Eight Nines*
- *The economic cost of 'rebuilding' existing utility-based system is prohibitive*
- *Assuring reliable, secure power will have cost premium for existing users*

Historically, utilities and Independent Power Producers have supplied electric power with 99.9 percent reliability, resulting in an average loss of 9 hours of electricity supply per year.

However, in an era when an interruption as short as a fraction of a second can cause major problems or equipment damage to e-commerce and other IT systems, this level of service could have disastrous consequences.

Unfortunately, rebuilding the existing system to meet the higher standards would make it too expensive to support the power needs by the current generation of end users on the grid.

## Virginia's Power Future High Tech Requirements

- *Accelerated construction deadlines*
- *Access to primary fuel source*
- *Access to transmission lines*
- *Other infrastructure and communications demands*

Many of the emerging power sector problems posed by Virginia's high-tech growth are linked directly to the concerns and needs of the industry itself:

Firms are demanding reliable power under accelerated construction deadlines, which may be beyond the utilities' capabilities to respond

Firms may demand access to primary fuel sources or distribution points, particularly to ensure high quality and reliable backup power

Merchant power plants will need access to - and will place an additional burden on - transmission lines for power wheeling, including to service out-of-state customers

Other long-term challenges are emerging linked to the need for secure and expanded fiber-optic and telecommunications capability

## **New Gas-Fired Power Plants Implications for Virginia**

- ***Curtailed natural gas available to service Virginia's economic growth***
- ***Reliance on natural gas will stress gas pipeline system***
- ***Appropriation of airshed, watershed carrying capacity to service out-of-state demand***

Almost all new power plants under construction or being planned in Virginia, whether merchant plant or utility, are expected to be fueled by natural gas. Their completion will significantly increase Virginia natural gas consumption levels.

The Virginia State Corporation Commission has cited concerns over limited gas pipeline capacity during peak usage periods, and noted that “a significant number of new gas-fired generation facilities would require a substantial increase in pipeline capacity.”

Funding for pipeline construction does not appear to be a constraint, but construction and expansion of pipelines – particularly in built-up areas – are likely to raise significant issues of easements, eminent domain right-of-way acquisition and community safety

Merchant power plants constructed to provide power for out-of-state customers may also tax airshed carrying capacity and water resources at the expense of in-state development.

## **Future Issues for Virginia Planners**

- *Overtaxed electricity and gas transmission and distribution systems*
- *Virginia primary energy resources to service out-of-state consumers*
- *Restrictive federal air quality regulations*
- *Carbon and emissions trading markets*

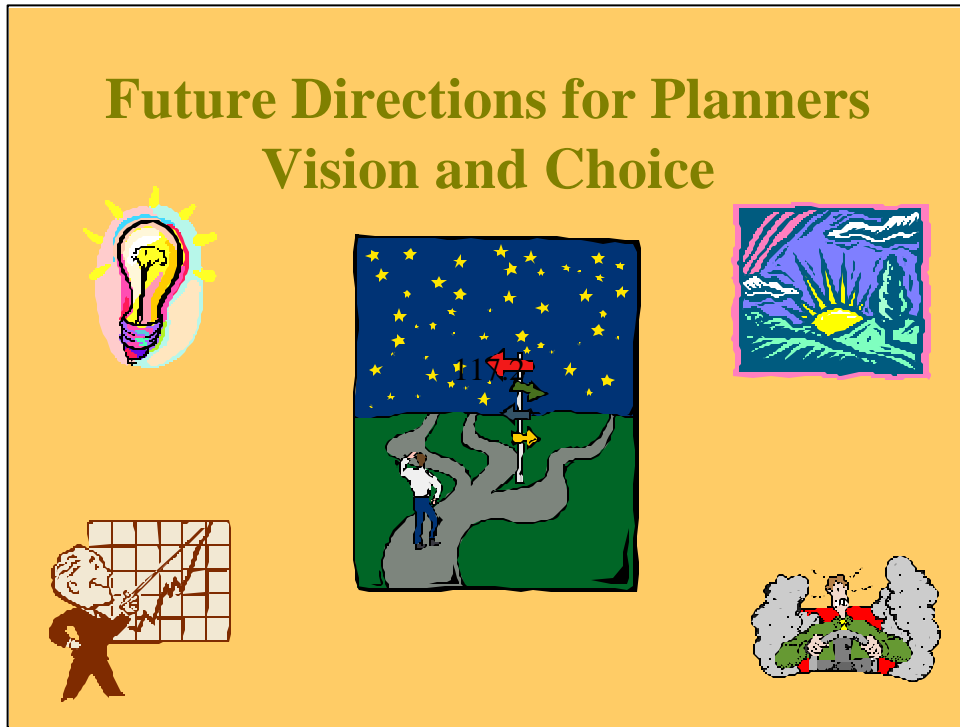
Virginia faces daunting growth-related impacts in its electricity and natural gas infrastructure, requiring new questions to be asked, new planning tools to be developed and new policy initiatives to be explored.

Nationwide, the electric power transmission capacity is falling further and further behind in its ability to service new electricity use patterns, but it is not clear how this trend will affect Virginia's development future.

Concerns also have been raised about the ability of Virginia's gas pipeline system to service the state's internal needs and growing appetite for gas in the power sector, particularly in light of increased national demand and competition for gas resources.

Still to be determined are the potential impacts of the Federal Clean Air Act on Virginia's airborne emissions, as well as any limitations on carbon emissions to satisfy global warming concerns. Although these air quality issues are not likely to have any effect in the short term, they could have a significant impact on the Commonwealth's future utility mix, particularly under programs to accelerate the nation's use of its coal resources.

## Future Directions for Planners Vision and Choice



As this presentation has attempted to show in a broad-brush manner, Virginia's recent development history underscores both opportunities and obstacles in sustaining growth in the high tech sector. As the Commonwealth proceeds towards a deregulated, market-based energy future, it will be increasingly important to understand and analyze these in detail and respond proactively. Future presentations will highlight both ongoing research and new research needs.



**For additional information:**



**Dr. Michael Willingham**  
**Alexandria Research Institute**  
**Virginia Tech**  
**206 N. Washington Street, 4<sup>th</sup> Floor**  
**Alexandria, Virginia 22314**  
**Ph: 703-535-3464**  
**Fax: 703-581-8085**  
**e-mail: [mwilling@vt.edu](mailto:mwilling@vt.edu)**

Thank you for listening to this Alexandria Research Institute presentation. If you would like to comment on the issues or format, or if you would like additional information concerning the source materials used in preparing the presentation, please contact Dr. Michael Willingham at the address shown here. ARI also welcomes any suggestions concerning topics for future presentations.