

*Fairfax County Chair's Private Sector
Energy Task Force*

*Supporting Information
for
Recommendations
to the
Board of Supervisors*



Energizing the Future
September 26, 2012

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Background

This report supports the recommendations made to the Board of Supervisors, and recommends the direction for continuing work by the County's proposed public/private sector partnership Energy Alliance.

The County's quest for energy efficiency evolved from its programs to reduce emissions from County facilities and vehicles, and evolved into energy efficiency initiatives aimed at cutting government costs. For example, the County school system since 2005 has increased building space by 815,000 sq. ft., enrolled an additional 10,880 students, while holding its energy consumption flat through a 6% improvement in energy efficiency. The County and its school system have saved nearly \$40 million in energy costs from these initiatives.

In 2007, Fairfax County led the creation of the nationwide "Cool Counties" initiative, in which localities adopted a goal of reducing energy consumption per capita by 2% per annum, which has evolved into the regional goal of an 80% reduction by 2050, measured against an MWCOG baseline.

With a population of more than 1 million inhabitants, County government approaches new initiatives by seeking advice from the County's business and civic leadership. In January 2011, the County Chair formed a Private Sector Energy Task Force (ETF) charged with:

"Identifying opportunities to develop a transformational vision, supported by achievable strategies that will define the steps our community can take to position itself as a leader in the area of energy efficiency, sustainability, and "green" technology".

ETF members first sought to educate themselves with briefings from nationally-recognized experts and discussion during meetings held at roughly monthly intervals from February 2011 through June 2012. This report is based upon the fact finding to date.

Notes on each meeting and the presentations received can be seen on the Fairfax ETF web site <http://www.fairfaxcounty.gov/chairman/energytaskforce.htm>.

The report is presented in three sections:

- 1) Commercial and residential buildings, together with their energy sources
- 2) Transportation
- 3) Goals

Summary

Goals

The County already has set several very challenging goals for improved energy efficiency, but there appears to be no realistic plans in place to meet these goals.

In 2006, Fairfax County produced 12 tons of CO₂ per capita. With the Cool Counties 2% per annum goal in place (49% reduction by 2040 – now merged with the MWCOG regional goal for 2050), a carbon neutrality goal for Tysons by 2030¹ and the potential establishment of individual goals for individual areas within the County, it would seem entirely feasible to see the County's CO₂ emissions reduced from 12 tons to around 3 tons per capita by 2050. To achieve this, however, will require:

- a) Creation of practical plans that can be implemented to meet these goals over the next 30 years;
- b) Sustained public *will* to meet the goals.

The City of Chicago is one of a number of cities that has developed a sophisticated energy model for its downtown area in order to provide a tool to:

- a) Assist in the evolution of practical plans;
- b) Assess the impact against the plan of proposed changes, whether to policy, land use, individual buildings or transportation.

A similar tool is needed by Fairfax County. Participation in the Department of Energy Challenge by the County could assist with the creation of the required model.

Buildings

Residential property accounted for 29.3% of Fairfax County energy consumption per capita in 2006; commercial property accounted for 29%². Any plan to increase energy efficiency by reducing consumption per capita must focus on residential as well as commercial property.

The Building Section makes recommendations for further work by the proposed Public/Private sector Partnership and summarizes ETF findings with respect to:

- Commercial and residential buildings
- County government, including the school system
- Technology
- Building operations
- District energy
- 21st century buildings
- Human behavior and the role of educational programs
- Conservation v sustainable energy
- Gas and electric utilities, telecoms, etc.
- Market demand, financial incentives, and return on investment

¹ Tysons Land Use and Transportation Concept Plan

² Fairfax County Greenhouse Gas Inventory – May 26, 2011

The cost of solar and wind generated electricity is expected to drop, leading to expanded use. In parallel, new, significantly more efficient power stations represent a major capital investment, which is reflected in the Virginia consumer's electricity bills. The combination of increasing cost for electricity from traditional sources, coupled with the reducing cost of electricity from sustainable sources, likely will accelerate the ability to generate commercially viable, sustainable energy.

Consequently, beyond 2020, it is reasonable to expect an increasing volume of our electricity to be supplied from near carbon-neutral and sustainable sources.

Fairfax County typically adds 2% of its building inventory each year³. If the County continues to add new construction at the rate of 2% per annum, by 2040, more than 40% of the building inventory will have been constructed since 2010, i.e. in the era of energy efficient buildings. New construction offers the greatest potential for energy savings on a per unit basis, and should be given equal priority with programs to improve the energy efficiency of property built before 2010. Buildings constructed before 2000 probably have greater potential for energy savings in the short-term, as their heating and cooling systems may be nearing replacement, and their design predates energy efficiency concerns.

Programs designed to stimulate energy efficiency improvements in old structures will be different to programs required to stimulate energy efficiency in new construction. The guiding principles, however, remain common to both.

Businesses and a majority of people will base their energy conservation decisions upon reducing costs. Most major employers and a growing percentage of the population already are moving toward energy conservation and the use of renewable energy, as they see the long-term benefits in terms of quality of life, and ultimately cost.

A number of programs applicable at various levels of government, from federal to County, already exist to help fund capital investment, and further incentives need to be developed within the County.

There are so many concepts being explored and so much information flowing from energy saving groups, companies and technologies across the nation, that it's difficult to decide when to draw the line and turn research into action. To stimulate a path through the confusion, the U.S. Department of Energy recently launched a Better Buildings Challenge (BBC). The BBC is a national leadership initiative calling on corporate Chief Executive Officers, university Presidents, and state and local leaders to make a significant commitment to building energy efficiency.

Transportation

Transportation accounted for 36%⁴ of the energy consumed within Fairfax County in 2006. Reductions in this consumption will be predicated upon changes in:

- Land use patterns;
- Highway and transit developments;
- Vehicle technology;
- Use of renewable fuels to replace fossil fuels;
- Some reduction in motorized trips.

Energy efficiency is synonymous with reducing CO₂, which unlike other vehicular emissions, does not decay rapidly, so its effect is cumulative.

³ Davis Carter Scott presentation to the ETF

⁴ Fairfax County GHG Inventory – May 26, 2011

Transportation is regional, and thus particularly sensitive to regional policies. However, in 2040, 77.5% of Fairfax County auto trips are expected to be internal to the County, and only 22.5% truly regional in nature⁵. Therefore, Fairfax County can have a major impact on transportation improvements to reduce energy consumption.

Between 2010 and 2040, a 34% increase in jobs, a 21% increase in population, and a 25% increase in households are projected for Fairfax County by the Metropolitan Washington Council of Governments (MWCOC).⁶ The County is moving toward Transit Oriented Development (TOD) to accommodate much of this growth. County-wide, today nearly 5% of residents live within walking distance of Metrorail stops, including the Silver Line now under construction, or VRE rail stops, i.e. live within one-half mile of a station, a figure expected to increase to 7.5%⁷ by 2040.

Conventional rail transit is expensive to construct⁸ and is only possible when right-of-way has been preserved. Over the next 10 to 20 years, most transit systems launched within the County or regionally likely will be road based. This will include Bus Rapid Transit (BRT), trolley, and conventional bus services. Consequently, most, if not all future transit within the County, will be affected by highway congestion⁹ for significant portions of the rider's journey.

Due to the need for transit to use highways and the need for most trips in the County to continue to use individual vehicles, a highway improvement program to eliminate, or at least drastically reduce congestion, provides the County with the largest opportunity for transportation energy reduction in the short and medium-term.

The economic, environmental and societal case for eliminating highway congestion in all but dense urban areas is compelling, as the cost of highway congestion is higher than the cost of the cure for households, as well as businesses and governments. Reducing highway energy consumption thus should be a rallying cry for pro and anti-highway interests.

Within Fairfax County, an estimated 38 gallons¹⁰ of fuel per capita were wasted in 2004 due to highway congestion, according to regional data published by the Texas Transportation Institute (TTI), the nation's leading authority on the subject, i.e. \$133 per man, woman, and child; \$532 a year for the average family of four with fuel costing \$3.50 per gallon.

Police activity generates approximately 20% of current highway congestion. Best practices for highway policing and safety in other countries should be studied and the information applied to regional roads.

Note:

- 1) Transportation solutions have to be achieved in concert with state and local partners.**
- 2) Funding for highway improvements is not discussed here, as the subject was considered to be outside the remit for the Fairfax Energy Task Force.**

⁵ Source: MWCOC 2010 CLRP (VDOT July 2011 amendments) and Version 2.2 travel demand model simulation

⁶ MWCOC Round 8.0 Cooperative Forecast

⁷ Source: Resident access to commuter rail stations in Northern Virginia, NVRC March 19, 2012

⁸ The Silver Line is possible because the Dulles Corridor was purchased in the late 1950s as part of Dulles Airport, whose planners acquired enough width to provide for local lanes – now the “Toll Road” Route 257, and a median preserved for a rail link.

⁹ The Dulles Airport Access Road is an exception, as it currently provides congestion-free travel on a dedicated right-of-way available to transit vehicles.

¹⁰ TTI reported that the Washington area wasted 162.7 million gallons of fuel in 2004 through highway delays. The Fairfax County population is 24% of the region's population considered in the TTI data.

Section 1

Commercial and Residential Buildings

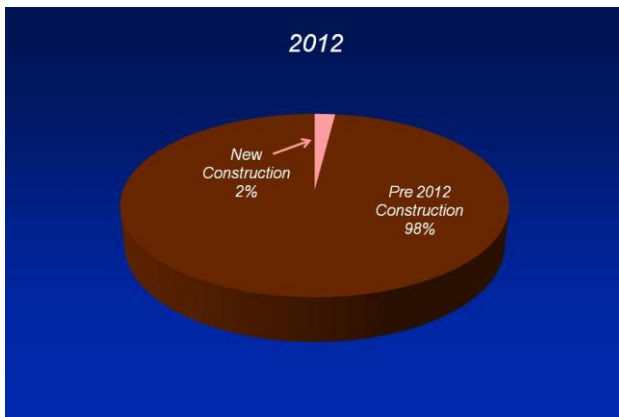
Residential property accounted for 29.3% of Fairfax County energy consumption per capita in 2006; commercial property accounted for 29%¹¹. Any plan to increase energy efficiency by reducing consumption per capita must focus on residential as well as commercial property.

New v Existing Buildings

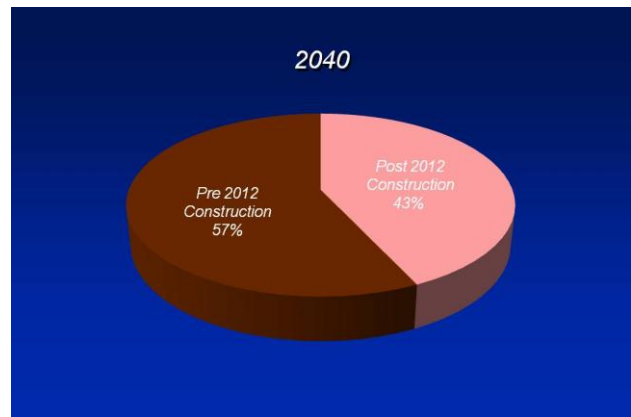
Fairfax County typically adds 2% of its building inventory each year, so in any given year, 98% of the inventory already exists. The existing building inventory thus offers way and above the largest potential return in terms of energy savings, particularly in the near-term.

However, if the county adds new construction at the rate of 2% per annum, by 2040, more than 40% of the building inventory will have been constructed since 2010, i.e. in the era of energy efficient buildings. New construction offers the greatest potential for energy savings on a per unit basis, and should be given equal priority with programs to improve the energy efficiency of property built before 2010. Buildings constructed before 2000 probably have greater potential for energy savings in the short-term, as their heating and cooling systems may be nearing replacement, and their design predates energy efficiency concerns.

Programs designed to stimulate energy efficiency improvements in old structures will be different to programs required to stimulate energy efficiency in new construction, i.e. post 2012. The guiding principles – incentive plus education – however, remain common to both.



Source: Davis, Carter, Scott, Ltd.



Based on 2% per annum new construction

¹¹ Fairfax County GHG Inventory – May 26, 2011.

For Tysons Corner, Fairfax County accepted its land use Task Force recommendations that:

- “New energy technology will provide opportunities for further innovation. With this knowledge, additional steps in building design and urban planning can be implemented to achieve the long-term goal for Tysons of carbon neutrality by 2030 and continuing leadership in environmental protection¹².”
- “Tysons redevelopment reduces carbon emissions to help achieve 80% carbon reductions by 2050 in accordance with the Cool Counties Policy established by the Fairfax County Board of Supervisors. These reductions will require reducing emissions from transportation and buildings.”

No plan to meet this challenging Tysons goal appears to exist.

The building challenge in Virginia’s heavily-regulated, relatively low cost energy environment is to:

- 1) Demonstrate the cost effectiveness of environmental and economic benefits of energy efficient technologies to both commercial property owners and homeowners.
- 2) Educate citizens and small business owners about the environmental and economic benefits of clean and efficient energy usage. Create energy “literacy” so that residents can clearly evaluate energy choices.
- 3) Expand and publicize the existing list of financial incentives for energy saving initiatives.
- 4) Identify, and ideally eliminate, procedural barriers to clean and efficient energy use at all levels of county, state, and possibly federal process.
- 5) Bring the public and private sectors together to generate action.

As a subset of the ETF, a Process Committee was formed under the leadership of Art Walsh, Managing Shareholder, Walsh Coloucci Lubeley Emrich & Walsh, P.C., to bring the development sector together with ETF members to seek guidance regarding the incentives that could be created and the procedural initiatives that the County could take to inspire building energy improvements.

County Government Activity, Including the School System

County properties and services account for 3% of Fairfax County’s total energy consumption.¹³

The County’s Facilities Management Department launched an energy initiatives nearly 10 years ago aimed at cutting emissions as well as government costs. The average 1% annual reduction achieved since 2001 by County government has resulted in a cost saving of \$7 million to date. The Government Center’s lighting, heating and air conditioning retrofit project is saving almost 10%, or \$100,000 a year. The County’s policy is to invest where there is a payback within a reasonable amount of time, so that the projects pay for themselves.

¹² “The Tysons Land Use and Transportation Concept Plan should include the flexibility to provide mechanisms for implementing ideas such as district energy systems, alternative energy sources, and district-scale environmental performance. This flexibility is necessary for Tysons to continue its leadership in environmental stewardship. The goal is for Tysons to become carbon neutral by the year 2030. A built environment that will be a model of environmental sustainability – The Plan reduces greenhouse gas emissions in Tysons consistent with Cool Counties objectives to reduce emissions 80% by 2050, measured from a 2006 baseline. These reductions will require reducing emissions from transportation and buildings. Requirements such as all buildings having LEED certification, or the equivalent, prior to 2013 and LEED -silver certification, or the equivalent, for all buildings approved in 2013 or later will be imperative for Tysons to be a model for other global urban centers. Transportation goals, such as reducing vehicle miles traveled (VMT) per resident to 10 miles per day will put Tysons on the forefront of sustainability. The existing regional VMT/day/capita average is approximately 30 VMT per day per capita: reducing daily per capita VMT in Tysons to 10 miles per day is a reasonable and attainable goal.”

¹³ Fairfax County draft GHG inventory – May 26, 2011.

The County's extensive school system is a key part of its energy efficiency program. Since 2005, school building space has increased by 815,000 sq. ft., 10,880 additional students have been enrolled, but total energy consumption has remained flat, and overall energy efficiency has been improved by 6%. Overall, the school system reports a savings of approximately \$30 million in energy use from its initiatives.

In 2007, Fairfax County led the creation of the nationwide "Cool Counties"¹⁴ initiative, in which localities adopt a goal of a 2% per annum reduction in greenhouse gas production per capita. Compounded annually, 2% is an extremely aggressive goal whose achievement would equate to a 49% reduction in energy consumption per capita by 2040, compared to the 2007 base year. This objective has evolved into the MWCOG regional goal that the County supports.

Today, the County is engaged in a broad array of energy efficiency projects, ranging from the recovery and use of methane gas from landfills and the conversion of trash to electricity¹⁵, to LED parking lot lighting. More information can be found at <http://www.fairfaxcounty.gov/chairman/energytaskforce.htm>.

The County should continue to lead by example and should be encouraged to leverage this example with the private sector as well as state government.

Technology

Sustainable energy technology, such as solar cells, is approaching cost effectiveness in the Virginia environment, while savings from on-demand water heating systems, water conservation, and new lighting systems can repay the investment in their installation in as little as 1.5 years.

Advanced Metering Infrastructure (AMI) is an enabling technology that is being used to better manage constrained generation and transmission grid resources, introduce new generation sources, including renewable and distributed energy supplies, and help customers manage their energy use. This technology also can be leveraged to promote efficient natural gas operations.

AMI currently is undergoing pilot programs in three areas of Virginia. There is a need to:

- a) Support wide scale application of AMI, particularly in Fairfax County, with the State Corporation Commission (SCC).
- b) Encourage the building industry to design for AMI.
- c) Encourage smart metering applications for natural gas and water customers.

"Shaving the peak" (see Conservation v Sustainable Energy) provides the electric utilities with a major incentive to conserve energy, as it postpones the need for capital intensive new power stations. Large commercial customers also have an incentive to shave their peak load, as their unit cost is keyed to peak demand and can be quite high, even though Virginia's overall energy charges are below the national average. Efficient building design and other alternatives, such as distributed generation and/or increased use of thermal energy, can reduce peak as well as overall consumption. Energy efficiency initiatives reduce the need for the construction of expensive new transmission and generation capacity, thus helping to maintain moderate electricity rates while offering key environmental benefits.

¹⁴ County presentation to the Energy Task Force on March 31, 2011. The presentation is available at http://www.fairfaxcounty.gov/chairman/pdf/energy_3.31.2011_fairfax.pdf

¹⁵ One ton of trash is produced per County resident per year.

Use of Natural Gas (NG) generates less undesirable emissions than coal and converts 90% of the delivered fuel into usable energy, as it is burned at application. The new Virginia gas distribution rates are designed to promote customer conservation. They closely align with the infrastructure costs incurred to serve the customer, rather than being based on volumetric usage. The cost of the NG commodity, which is the largest part of the customer bill, is a direct pass through cost to the consumer. Under this model, the utility is immunized from fluctuations in gas price and given an incentive to help its consumers conserve via a growing variety of high-efficiency appliances, including on demand hot water heaters, appliance rebates, programmable thermostats, and energy audits.

Leadership in Energy and Environmental Design (LEED) certification, Energy Star, and equivalent programs provide energy efficient standards for new as well as existing buildings. An existing building's energy efficiency typically can be improved by 30% to 50%.

As the heating, ventilation, and air conditioning systems in existing buildings require replacement, typically at 10 to 20 year intervals, opportunities occur to install higher efficiency systems with improved operating efficiency.

Over the last decade, LEED certificated buildings have grown in market demand, and now command higher rents that more than offset the investment in the LEED certification.

The technology exists to construct buildings that run entirely on sustainable energy, and thus have zero emissions.

Building Operation

Modern building systems have advanced technologically to increase performance and conserve energy. These systems go well beyond reduced lighting, heating, and cooling outside working hours. For example, pumps within the County headquarters building automatically and continuously adjust the flow of heating and cooling water to meet the temperature requirement at any point in time.

These sophisticated systems require qualified staff to maintain their efficiency. ETF members noted that:

- For many buildings, better maintenance can reduce energy use by as much as 15%.
- Companies that raise energy consumption to the top management level are saving through the focus placed upon all aspects of the companies' energy use, including building system performance.

A few buildings now provide real-time displays, often in the entrance lobby, to show the building's energy status and demonstrate the company's interest in energy conservation and sustainability (see Education and Human Behavior).

Actions should be considered by the proposed Energy Alliance to:

- Stimulate top management interest in efficient building operation, as well as energy saving initiatives in all aspects of a company's operation.
- Provide information on the available software and systems for the real-time display of building performance.
- Translate real-time display into universal units of energy efficiency that can be easily compared, by either using Source-based BTUs per square foot, or GHG emissions per square foot.

District Energy

District Energy refers to clusters of buildings that generate their own power and share heating and cooling facilities. The concept is used in campus settings, airports, and some downtown areas. Dulles and National Airports, George Mason University, and portions of the federal government in the District of Columbia are among the local users of District Energy.

District developed and distributed energy concepts could provide a key step that promotes the use of sustainable and renewal energy, beyond LEED certification, within Fairfax County. Critical elements that would determine the viability in Fairfax County for District Energy initiatives include: whether or not districts with sufficient energy generation resource and users are located within practical proximity; the desirability for changes in Virginia's regulatory environment¹⁶; and whether or not district energy concepts are supported by private investors. A number of potential opportunities for their application exist within the evolution of mixed use dense areas of development such as Tysons Corner, as well as in other parts of the Dulles Corridor and within the Lorton/South County area.

MWCOG recently launched an initiative to advance District Energy utilities, combined heat and power and micro grids. Arlington and Loudoun Counties have initiatives exploring the commercial viability of District Energy; Arlington with respect to Crystal City, and Loudoun regarding local generation and the reuse of waste energy from data centers.

While some experts argue that district energy concepts are outdated technologies (they have been in use for over 100 years), others believe they are a key step that needs to be taken beyond LEED certification in certain dense urban and campus environments, while still others argue that the concepts are impractical in Virginia's regulated environment, and with voter attitudes conditioned by the image of old coal-fired electrical generation. However, on-site generation of electric power has many potential benefits and can help shave the rising demand for electricity, easing transmission and generation constraints. On-site generation enables the recapture of otherwise wasted thermal and transmission energy.

In reality, whether or not distributed energy concepts are applied is a decision that will be made by investors. If the investor sees a payback from the application of these technologies, they will be applied.

Integration of Technologies for 21st Century Buildings

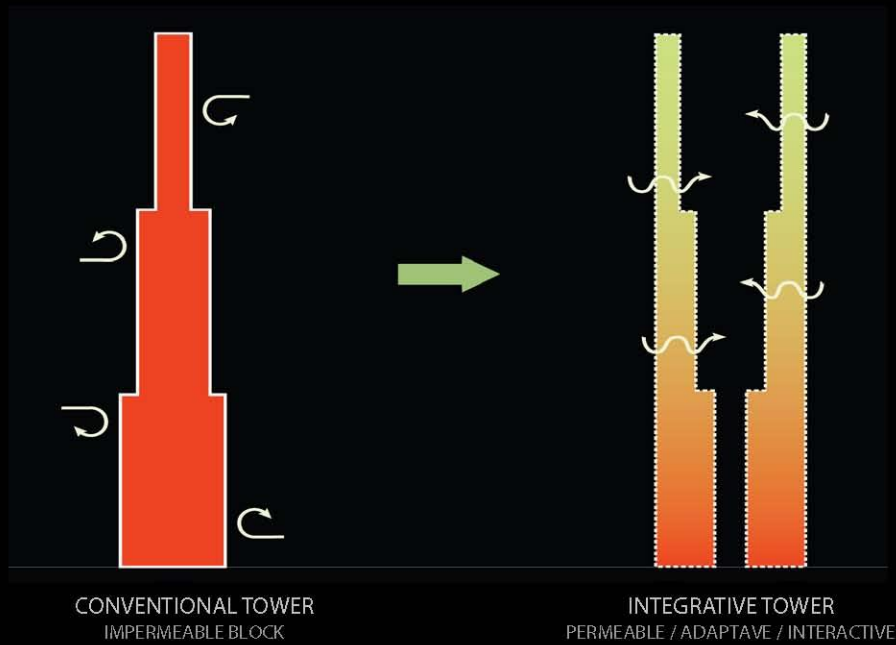
Major advances have recently been made in building technology¹⁷.

Application of these technologies within the County would be "transformational" and attract world attention. These new technology buildings essentially are vertical cities compared to Tysons Corner, which is planned as a traditional horizontal city with nodes of tall buildings clustered around Metrorail stations. However, these technologies may well have "transformational" application at Tysons Corner, and the potential exists at Lorton to develop short and long-term self-powered developments as part of a "Green Triangle" landmark on the County's southern border.

Traditional building concepts are designed to withstand the forces of nature. The new concepts apply the forces of nature to serve the building's inhabitants, and thus the building is more a sophisticated machine than a constructed mass.

¹⁶ For NVRC, Hunton & Williams has developed a roadmap and decision tree through Virginia's regulations.

¹⁷ Application of these technologies obviously varies with geographic location, its climate and governmental procedures.



Source: Roger E. Frechette, President, PositivEnergy Practice

The major, natural forces on a skyscraper are the sun and wind, which are interlinked.

Two examples:

- Firstly, the Pearl River Tower, now under construction in China, sets new standards for energy efficiency. A “solar engine” drives light (through fiber optics) and fresh air through the building. Radiant “cold” and heat from ceilings and floors provide the air conditioning. This takes less space between floors and the compression provides the building with five more floors of rentable space.

PEARL RIVER TOWER

Guangzhou, China

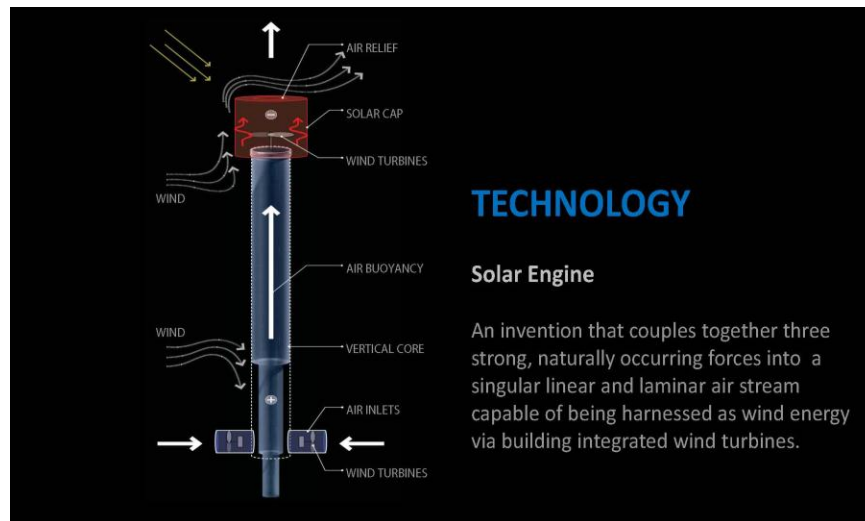
A “SUPER-TALL” SPONGE

- Wind-Powered
- Water-Cooled
- Breathable Skin
- Radiant Comfort
- Solar-Collecting



Source: Roger E. Frechette, President, PositivEnergy Practice

- Secondly, a mixed-use tower now nearing completion in Seoul, Korea applies solar and wind energy to take care of ventilation, as well as much of the heating and cooling requirement, thus reducing the energy need by 38%. The tower is essentially built around a vertical shaft or chimney. This “chimney” generates a natural upward flow of air, which is magnified by wind and the aerodynamic design of the roof. The airflow is sufficient to drive turbines¹⁸, which generate electricity. Fresh air is brought in via the flow and “conditioned,” but is not re-circulated as it would be in a conventional air conditioning system. This provides a healthier environment.



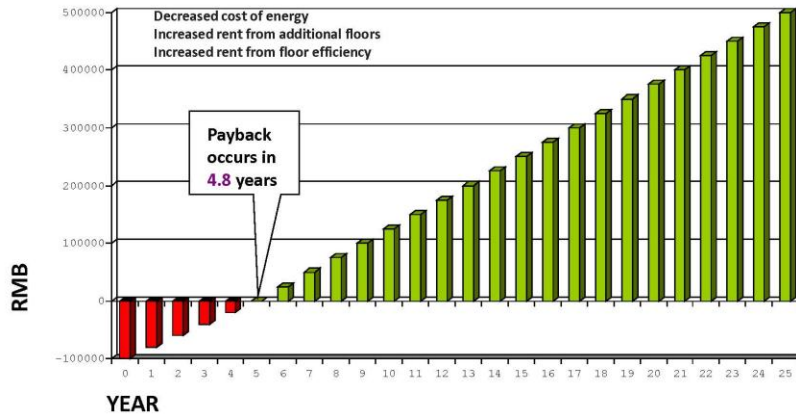
Source: Roger E. Frechette, President, PositivEnergy Practice

In both examples, the natural forces around a building are put to work.

The wind on a building is the major force structural engineers must contend with. By using the wind, the need for structural strength, and therefore cost, is reduced. These 21st century buildings should be thought of as machines, as they are no longer simply a concrete, steel and glass mass with heating, cooling and plumbing.

¹⁸ A turbine operating in a venturi created by the building's shape can generate as much power as 27 similar capacity wind turbines in the field.

CUMULATIVE INVESTMENT IMPACT OF SUSTAINABLE MEASURES



Source: Roger E. Frechette, President, PositivEnergy Practice

Education and Human Behavior

*Write and they read.
Speak and they may listen.
Involve and they understand.*

Education in its broadest sense is an action that underpins every recommendation of the ETF from policy to implementation. Education involves:

- Promotion to show employers and citizens how they can save money through energy efficient practices and products.
- Initiatives to engage employees, communities, homeowners, etc., to make energy saving fun, financially beneficial, and something to be proud of.

County staff pursued the ETF's initial recommendation concerning education, and gained a federal grant for a pilot program. Golin Harris was engaged to execute the pilot. The pilot program is working with seven citizens associations. The goal is to educate and "get people talking." The pilot will use a broad range of publicity concepts, from events to social media. Further details can be found at www.fairfaxcounty.gov/energyactionfairfax.

Wetlands Solutions' building in Gainesville, Virginia¹⁹ is energy efficient and recently added solar arrays to its roof, which now provide up to 30% of the electrical needs for the building. A display in the company's lobby provides real-time information on the level of renewable energy being used, as well as other related information. Employee enthusiasm is palpable.

The County school system has evaluated various programs for "engaged" education and has adopted the Eco-Schools-USA Green Flag program²⁰ at many schools. Other schools are being encouraged to participate.

¹⁹The Northern Virginia Electric Cooperative (NOVEC) assisted Wetlands Solutions in receiving a grant to build one of the largest rooftop solar facilities in Northern Virginia.

²⁰"Shut the door, we're not paying to heat the whole neighborhood!" is a familiar cry from many childhoods. In Kentucky, that is being reversed by a school program that is causing students to encourage parents not to consume what they do not need.

The promotion will need to combine traditional advertising with social media, conventional public relations, and a trade show.

The first priority for the ETF's recommended successor is to develop knowledge regarding the:

- Existing successful programs and their means of implementation.
- Financial incentives currently available at various levels of government.
- Initiatives available for reducing energy consumption in existing homes and commercial properties.
- Relevant products and services available to Fairfax property owners.
- Definitions and measurements of energy efficiency as recommended by The National Academies and as used in the County GHG emissions inventory.

Part of the initial short-term promotional goal could be increased sales of energy efficiency products and services, as well as a modest reduction in energy use per capita.

The promotional objective should be defined for an education program. Resources to leverage include:

- The Fairfax Economic Development Authority's (FEDA) expertise to develop and cost a traditional promotional program.
- Washington Gas and other expertise on "engagement."
- Coordinate with the school system initiative.
- The Fairfax Chamber's expertise to create a "how to" guide covering available grant programs, products and services, and achievable energy cost reductions.
- Build upon the County staff's residential pilot program.

A major innovative and sustained promotional program will be required if the County is to make a measurable dent in the energy consumption per capita, particularly for existing properties. *Innovative, because the message should not become stale with repetition – repetition to ensure that the information is at hand when a parallel event triggers a property owner's interest.*

As much of the County's economic development comes from companies already here, indirectly the promotion also will promote the County as an attractive location for the new energy industry. As the promotion can provide a catalog of products and services, it may be possible to fund a portion of the promotional program with donations from the companies whose market will expand.

Conservation v Sustainable Energy

Returning the County to pre-1950 living standards would reduce energy consumption per capita by around 75%! But, the goal is to:

- 1) Enhance living standards by using energy more efficiently, thus conserving energy.
- 2) Move to renewable (or sustainable) fuels, i.e. fuels that do not add to GHG production.

The County's energy reduction objectives will be achieved partly through increased efficiency and reductions in per capita demand, and partly by a gradual move to the use of renewable energy. For example, in Virginia, Dominion Power's and NOVEC's "green power initiative" offer to provide their customers with electricity generated entirely from renewable sources for an additional 1.5¢ per kilowatt hour. To achieve this, the companies have purchased Renewable Energy Certificates (RECs) from wind and bio-mass generating facilities in Missouri, Illinois, Indiana, Iowa, Louisiana and Pennsylvania.

NOVEC is building a new biomass power station in Halifax County, VA. It will be fueled by wood waste, called slash. The plant will use a special process to manage emissions, and will therefore be carbon neutral. In other words, it will not add any more GHG to the ecosystem than would be released through natural decomposition.

In Virginia, 35% of the electricity is generated from nuclear power stations and 30% from traditional coal-fired stations²¹. Much of the generating capacity is financially depreciated – a principal reason for Virginia’s very low electricity cost.

To meet growing demand, Dominion Power is importing about 25% of its electricity from other states and building new capacity.



Dominion Power plans to open this \$1.1 billion generating plant in Warren County in 2015. The 3-cycle plant will be the most efficient built in the world to that date, as it will convert 20% of the energy in the fuel burned to electric power.

For example, in 2015, Dominion Power plans to open a \$1.1 billion three-cycle generating plant in Warren County, with a planned efficiency of 70% – 20% higher than the Possum Point facility and a new world record in efficiency. Hot exhaust gases from the primary turbines are used to drive secondary and tertiary turbines so that 70% of the energy in the fuel is converted into electrical energy. The new unit’s output will be equivalent to a nuclear generating plant.

²¹ The remainder is generated by Natural Gas – 13%, and other sources, including imported power – 26%. The 2026 mix is projected by Dominion Power to be 20% other, 23% Natural Gas, 22% coal, and 35% nuclear.

The generating capacity required is driven by the need to meet peak demands. “Shaving the peak” minimizes the need for new investment in generating capacity. Besides building innovative, new electrical generating facilities, Dominion Power is planning to rent roofs on commercial properties in Northern Virginia for the installation of solar arrays. The objective is to generate power on a relatively large and renewable scale, in order to shave the peak. Adopting policies that enable other non-utility third parties to own and operate on-site solar (Photovoltaic) or other forms of distributed generation with long-term power contracts, offers another cost-effective model to shave the peak.

Dominion Power recently applied to the Virginia State Corporation Commission (SCC) for permission to buy solar-generated electricity from residential and small commercial customers at 15¢ per kilowatt-hour for a five-year demonstration period. The demonstration project would be limited to 3 megawatts total, or 3,000 kilowatts. The typical residential solar installation in the company's Virginia service area is 4 kilowatts.

This is one example of the initiatives being undertaken by Virginia’s electric utilities and other regional energy providers to move to sustainable energy in the short to medium-term. Longer term, increased use of Natural Gas, which can reduce but not eliminate a power station’s emissions, and new technologies to enable carbon sequestration for Natural Gas as well as coal, will lead to a significant increase in the production of reduced carbon electricity and of electrical generation through use of sustainable fuels and solar energy. Future carbon-neutral fuels derived from aviation also may have application to electric power generation.

In southern Fairfax at Lorton, the presence of electricity generation from garbage and methane capture, solar generation, and significant developable land, juxtaposed to large public consumers of energy, provides a major opportunity to create a 21st century zero emissions, mixed use community. Public and private sector organizations should be encouraged to promote the generation of sustainable and renewable energy on their properties, where feasible.

The cost of solar and wind generated electricity is expected to drop, leading to expanded use. In parallel, new, significantly more efficient power stations represent a major capital investment, which is reflected in the Virginia consumer’s electricity bills. The combination of increasing cost for electricity from traditional sources, coupled with the reducing cost of electricity from sustainable sources, likely will accelerate the ability to generate commercially viable, sustainable energy.

Consequently, beyond 2020, it is reasonable to expect an increasing volume of our electricity to be supplied from near carbon-neutral and sustainable sources.

In the near-term, however, progress toward the proposed goal of reduced energy per capita can be expected to come from energy efficiency initiatives.

It is recommended that the ETF’s successor should:

- 1) Investigate and recommend County actions to stimulate accelerated production and use of renewable energy, both for the private sector as well as for the County.
- 2) Support utility and private sector initiatives toward renewables.
- 3) Explore the potential for a Lorton area model zero emissions development.
- 4) Investigate third party power provider options with associated incentives for incumbent electricity providers to support such introduction.

Gas and Electric Utilities, Telecoms, etc.

The ETF's successor should bring the gas and electric utilities together to explore the potential for initiatives that are mutually beneficial, while advancing District Energy utilities, combined heat and power and micro-grids to shave power station peak demand, improve energy efficiency, and reduce emissions, i.e. initiatives that benefit utilities, building owners and consumers²².

Telecommunications is a fertile field for energy efficiency gains, as user (home and workplace), data centers, and other such activity involve high energy use and generate significant heat that currently is wasted in most instances.

Market Demand, Financial Incentives, and Return on Investment

Businesses and a majority of people will base their energy conservation decisions upon reducing costs. Most major employers and a growing percentage of the population already are moving toward energy conservation and the use of renewable energy, as they see the long-term benefits in terms of quality of life, and ultimately cost.

A number of programs applicable at various levels of government, from federal to County, already exist to help fund capital investment, and further incentives need to be developed within the County.

Existing buildings fall into several categories:

- Owner occupied property, residential as well as commercial, in which the owner will reap the benefits of investments in energy saving improvements.
- Leased and rental property, in which the tenant will reap the benefits, which makes the owner reluctant to invest in energy saving changes. The tenant is reluctant to pay a higher rent, as the promised energy savings may not occur to the level stated. In a survey, 60% of New York City owners said this problem of “split incentive” was an impediment to making energy retrofits.

Energy Aligned Lease

To resolve the split incentive problem, an energy aligned lease concept has been developed and is being applied in New York City. The concept was developed through a working group of major building owners, tenants, property managers and others convened by the Office of the City's Mayor.

The working group found that the actual energy efficiency retrofit savings generally were within plus or minus 20% of the projection. That led to a concept in which the building owner's cost recovery is based on a prediction of savings, but the capital expense passed through to the building tenant is limited to 80% of such predicted savings in any given year. This provides the tenant with a cushion to protect against under performance, and provide the owner with a payback, extended by 25%. The result is a transaction that is net cash flow positive for both landlord and tenant. Two important aspects of this solution:

- 1) The matter is a contract between landlord and tenant, so no enabling legislation is required at the federal or state level.
- 2) The energy utilities are not involved, as again, it's a transaction between tenant and landlord.

²² Just feel the heat thrown off by modern TV and computer screens left on all day – heat that we pay for the air conditioning to remove in summer.

For further information, including a financial example and model energy aligned lease, see <http://www.nrdc.org/greenbusiness/cmi/energy-efficiency-leases.asp>.

Challenge Grants

As the ETF has found, there are so many concepts being explored and so much information flowing from energy saving groups, companies and technologies across the nation, that it's difficult to decide when to draw the line and turn research into action. To stimulate a path through the confusion, the U.S. Department of Energy recently launched a Better Buildings Challenge (BBC). The BBC is a national leadership initiative calling on corporate Chief Executive Officers, university Presidents, and state and local leaders to make a significant commitment to building energy efficiency.

The BBC goal is to make American buildings 20% more energy efficient by 2020.

The U.S. Department of Energy, in conjunction with its federal partners, states it will support program participants by:

- Providing expert technical assistance and energy efficiency implementation models.
- Connecting Partners²³ with a network of Allies²⁴ (including financial, technology, and service organizations) that can help them achieve their energy savings pledges.
- Publically recognizing Partners and Allies for achieving energy and cost savings and applying innovative energy efficiency solutions.

Fairfax County could move toward its goal by becoming a Local Government Partner to the BBC, and also by encouraging the County's major building owners and developers to become BBC Partners. The primary requirement of BBC Partners is to achieve a portfolio-wide energy savings goal of at least 20% by 2020 and the development of an organization-wide plan, including schedules and milestones. Partners commit to sharing their facility's energy consumption data biannually as well as the tools, technologies and processes they use to meet the goal. Fairfax County already is supporting a 20% reduction by 2020 through the MWCOG goal.

In addition, the County could add a public outreach component to a BBC commitment by encouraging owners of private sector buildings in the County to participate as partners with the County. A corporation could commit only their Fairfax County buildings to the program without making a corporate-wide commitment for all of their U.S. building portfolio. Atlanta has successfully incorporated such an outreach program in their BBC commitment. For more information, contact Sarah Zaleski (Sarah.Zaleski@ee.doe.gov), the person responsible for BBC Local Government Partners.

Fairfax County should consider becoming a Local Government Partner in the BBC program with an outreach component for partnering with individual commercial buildings in the County. Doing so will firmly establish Fairfax County as a leader in energy efficiency and sustainability, and support the mission of the ETF.

²³ Partners are companies, universities, and municipalities that make a public commitment to implement plans to achieve lasting, organization-wide energy savings.

²⁴ Allies are service providers, financial institutions, and technology companies that make a public commitment to support the energy efficiency marketplace.

Business Improvement Districts (BID)

When 70% of landowners in an area agree, they can petition the County to form a Business Improvement District (BID) in which real estate taxes will be increased by 1% to create a fund that members can draw upon to finance improvements. Community Development Authorities (CDAs) are another vehicle that can be used. Both need clearly defined benefits for those taxed. The District of Columbia's Downtown BID has become a leader in the promotion of energy efficiency.

Other Existing Programs

Many existing programs to help property owners invest in energy efficiency are described in a Davis, Carter, Scott (DCS) report. They include:

- 1) Tax credits and abatements: Abatements work by exempting property owners from paying taxes for a period of time. Credits work by crediting specific tax liabilities back to the relevant property owners, DCS states. Credits and abatements are being applied to homes and developments that achieve measurable, verifiable green building goals. Programs currently exist in the states of Maryland and New York, as well as in Baltimore County, MD, Cincinnati, OH and Howard County, MD. Solar property tax credits are currently available in Fairfax County: <http://www.fairfaxcounty.gov/dpwes/forms/solarenergy.pdf>. The County already is able to apply deferred tax incentives.
- 2) Grants: Grants for green building developers and homeowners are being established by state and local governments to stimulate energy efficient projects. These programs can be funded through taxes or fees, or through federal and state funds. New York State, El Paso, TX, Pasadena, CA, and Seattle, WA offer grant programs.
- 3) Revolving loan funds may have significant appeal in Virginia's low tax environment.
 - Babylon, NY has a self-financing program. The town added carbon to its definition of solid waste, and then tapped solid waste collection funds for major home energy improvements. Residents repay the loan on a scale that takes advantage of the reduced energy cost. Repayment schedules are attached to the home and carry over to a new owner.
 - Berkeley, CA helps homeowners invest in solar arrays. Projects are repaid through a property tax on individual program participants spread over 20 years. The tax obligation remains with the property if the home is sold.
 - Cambridge, MA has created a city sponsored non-profit Cambridge Energy Alliance (CEA), which is investing over \$100 million over six years. CEA participants (residents and businesses) can pay for their energy efficiency projects through the CEA. Loan repayments are matched to energy savings. Reportedly, no up-front costs are required for energy saving installations, and there will be no cost to Cambridge or state taxpayers.
 - Milwaukee, WI offers financing for home energy retrofits through its Me2 program. Me2 offers long-term repayment through additions to municipal or utility bills, reportedly at less than the cost of the energy saved. Repayment schedules are attached to the home and carry over to a new owner.
 - Sonoma County, CA provides loans for energy efficient projects to commercial and residential property owners. The loan is repaid through an assessment on the property paid with the property tax. Five, 10 and 20-year terms are available at a 7% interest rate.
- 4) Technical assistance programs are provided by Oakland, Pasadena, San Diego and West Hollywood in CA, and are being considered by Washington, DC.
- 5) Marketing assistance is being offered by Oakland and San Diego, CA through recognition and technical assistance.

Within Virginia:

- 1) Energy calculators exist on most utility company web sites to enable a homeowner to see the anticipated savings from the installation of new windows, more insulation, and other energy saving initiatives. For commercial operators, the utilities will provide audits and energy saving recommendations: *NOVEC* – http://www.novec.com/Power_Use_It_Wisely/index.cfm; *Washington Gas* – <https://eservice.washgas.com/>; *Dominion Power* – <http://www.dom.com/dominion-virginia-power/customer-service/energy-conservation/ec-programs.jsp>.
- 2) Local Energy Alliance Program (LEAP) is an offshoot of the Federal Energy Star program started by the EPA to certificate energy efficient consumer products. The EPA initiative includes a pilot building labeling program. To gain the Energy Star certificate, a home would have to achieve a 20% reduction in energy. The expectation is that the acquisition of Energy Star labeling would improve the value and resale value of the home.
- 3) The PACE program may provide financing for energy efficiency improvements. Under the program, the loans run with the property, not the ownership, and so can be long-term in nature. The PACE concept has experienced legal difficulties in California and may have constitutional challenges in Virginia. But, there may be elements of the concept that can be adapted to provide an attractive, long-term incentive, possibly in conjunction with the banks.

New initiatives to be looked at include:

- 1) Deferred real estate taxes and transferable development rights (being considered by the Walsh Process Committee).
- 2) Local banks could be invited to establish loan programs for energy efficient improvements. Energy efficient buildings are reported to be in demand and to command higher prices, and therefore, should provide a reliable investment for banks.
- 3) The Planning Commission's initiative to offer the Board of Supervisors an updated green building policy should be supported, and the Commission should be encouraged to support development of renewable energy facilities and energy efficiency on a commercial scale.
- 4) Explore with County staff ways in which the site approval timescale for County process could be further compressed for transformational energy projects. The concern is with the process, not the staff. In competitive states, counties have been known to assemble a Tiger team to approve a desired commercial development within 24 hours; 24 hours is not feasible in Fairfax County, but it should be possible to streamline the process and compress the timescale to a matter of weeks, rather than years²⁵. Condensing site approval time would eliminate a major element of risk for a developer, and hopefully save County staff time. A similar concept could be applied to projects that promote renewable energy facilities on a large commercial scale.
- 5) The adoption of policies that will attract third parties to finance or own small, clean/renewable distributed generation installations.

Items 1, 4, 5, and 6 are the subject of the Process Committee.

Incentives need to be applied to reward those already moving toward energy conservation and renewable energy production, and to incentivize those who are not yet so doing.

It is strongly recommended that the proposed successor organization Energy Alliance examine the DoE Challenge, the New York City split lease concept, and develop other practical incentives.

²⁵ Approvals for the first Tysons redevelopment projects have taken well over one year.

Section 2

Transportation

Transportation is regional, and thus particularly sensitive to regional policies. However, in 2040, 77.5% of Fairfax County auto trips are expected to be internal to the County, and only 22.5% truly regional in nature²⁶.

Figure 1

	2011	2040
Total average daily trips beginning or ending in Fairfax County	3,377,212	4,014,969
As a subset of the above total average daily trips that begin and end in Fairfax County	2,557,698	3,112,226

Therefore, Fairfax County can have a major impact on transportation improvements to reduce energy consumption by:

- Internal County actions;
- Example and leadership through NVRC, NVTa and TPB;
- Working for a unified Northern Virginia position with the Virginia Administration and General Assembly²⁷.

Transportation accounted for 36%²⁸ of the energy consumed within Fairfax County in 2006. Reductions in this consumption will be predicated upon changes in:

- Land use patterns
- Highway and transit developments
- Vehicle technology
- Use of renewable fuels to replace fossil fuels
- Some reduction in motorized trips

By 2040, we can expect to see:

- More reliance on transit
- A slightly higher percentage of the population living within mixed use developments that provide residences within walking and bicycling distance of shops, libraries, etc.
- Increased use of rental or shared cars for occasional use

However, a majority of the County population and most regular transit users will still need an automobile for many, and in most cases, all trips.

Land Use Patterns

Between 2010 and 2040, a 34% increase in jobs, a 21% increase in population, and a 25% increase in households is projected for Fairfax County by the MWCOG.²⁹

²⁶ Source: MWCOG 2010 CLRP (VDOT July 2011 amendments) and Version 2.2 travel demand model simulation.

²⁷ Fairfax County is home to 1 in every 8 Virginians.

²⁸ Fairfax County GHG Inventory – May 26, 2011.

²⁹ MWCOG Round 8.0 Cooperative Forecast.

The County is moving toward Transit Oriented Development (TOD) to accommodate much of this growth. This is seen in the higher density development in areas such as Tysons, Merrifield, Reston, Springfield, and others. The County should continue to follow a policy of expansion for business and residences in these areas, as well as preservation of existing lower-density development and open space.

Fairfax County Projected Growth

	2010	2040	Difference	
Households	386,000	483,200	97,200	25.18%
Jobs	641,300	861,700	220,400	34.37%
Population	1,056,400	1,281,300	224,900	21.29%

Source: MWCOG Round 8.0 Forecast

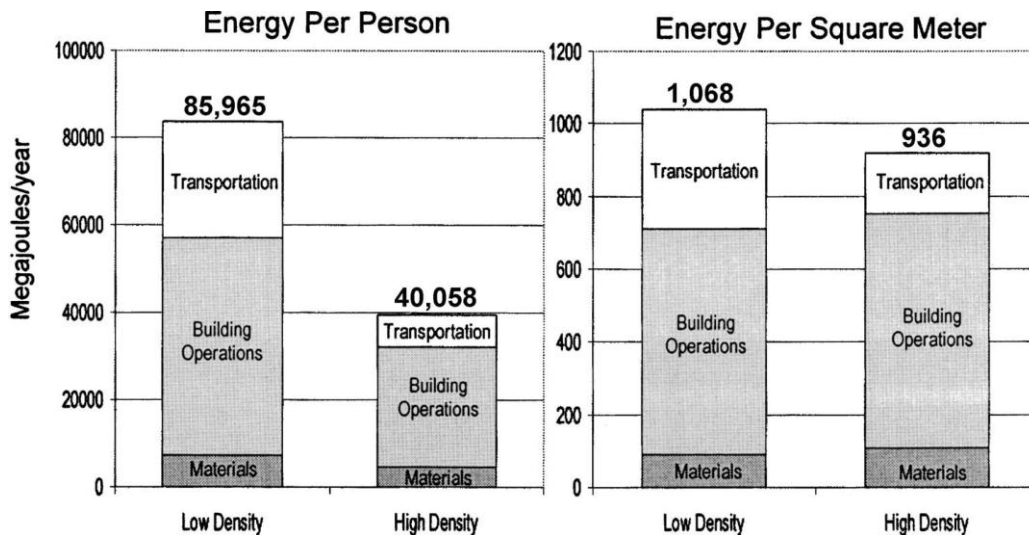
Higher density TOD results in fewer cars per household and increased use of transit, pedestrian, and in some instances bicycle³⁰ activity. While auto trips per household may decline, TOD can lead to more vehicles per acre.

One Acre of Land

Number of Households	Vehicles per Household	Number of Vehicles/Acre of Developed Land	Walking Distance of Transit
1 Large Home	3 - 4	3 - 4	Rarely
3 Single Family Homes	2.5	7.5	Rarely
10 Townhouses	2.0 - 2.5	20 - 25	Sometimes
30 Apartments	1.3 - 1.8	39 - 54	Sometimes
100 Highrise Apartments	0.8 - 1.0	80 - 100	Normally yes

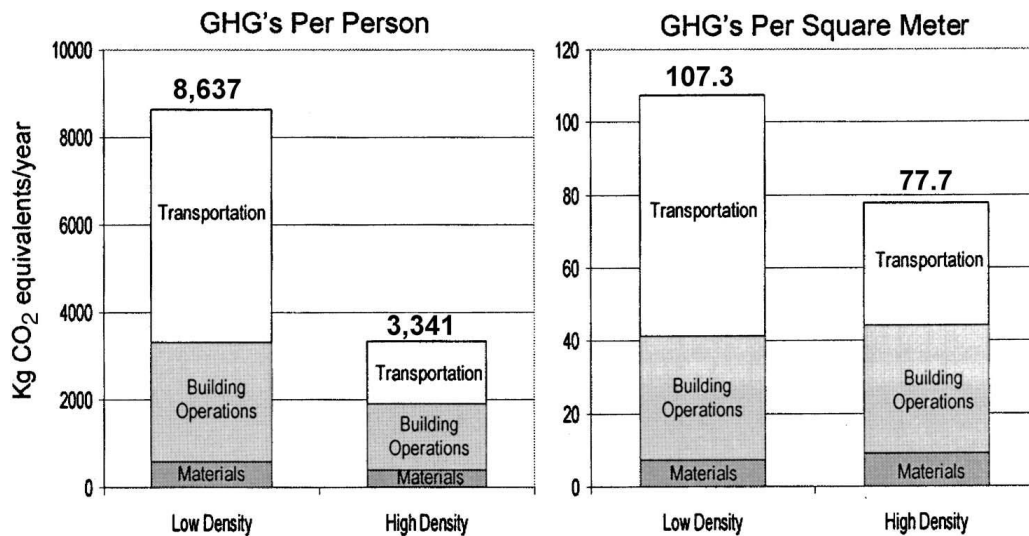
Higher density and TOD also results in lower energy use and lower GHG emissions as compared to existing single-family development patterns, as shown in Figure 2.

Figure 2
Energy Use and GHG Emissions – Low and High Density Development³¹



³⁰ Bicycles play an increasing role in some Fairfax communities, but are otherwise used more for recreation than commuting in this area.

³¹ Source: Journal of Urban Planning and Development, ASCE; March, 2006, pages 10-16; downloaded from http://www.sb4all.org/uploads/Comparing_High_and_Low_Residential_Density_Life_Cycle_Analysis_-_Energy_Use_and_Greenhouse_Gas_Emissions.pdf.



New development, when practical, should be designed to facilitate use of transit and non-motorized transportation options. The County should continue to use pedestrian and bicycle-friendly design concepts, such as “complete streets” to provide attractive alternatives to encourage less use of single-occupant vehicle transportation.

However, it should be noted that while use of “complete streets” and transit level densities, combined with guaranteed rides home and new concepts such as Zip Cars, provide attractive market driven alternatives to car ownership, this will be limited to a relatively small percentage of the County’s population. Most County residents still will be dependent on the automobile or highway based transit, and virtually all households, even within urban communities, will require use of an automobile. County-wide, today nearly 5% of residents live within walking distance of Metro, including the Silver Line, now under construction, or VRE rail transit, i.e. live within one-half mile of a station – a figure expected to increase to 7.5%³² by 2040, with much of the County’s growth accommodated in new TOD developments. When the radius around rail stops is doubled, the percentage of the County’s population living or projected to live within one mile of a rail transit stop increases to 18% today (including the Silver Line) and 24% in 2040. These figures underline the value of finding novel, all-weather ways of expanding access to rail transit stops.

Figure 3

	2011	2040
Transit trips with either Origin or Destination in Fairfax County	105,777	176,676
Fairfax to Fairfax (subset of above)	34,876	68,106

Figure 4

	2011	2040
Total auto trips with Origin or Destination in Fairfax County	3,377,212	4,014,969
Total transit in Fairfax County	105,777	176,676
Transit share of total	3%	4.4%
Total auto and transit	3,482,989	4,191,645

³² Source: Resident access to commuter rail stations in Northern Virginia, NVRC March 19, 2012

The Ballston-Rosslyn Corridor

Arlington County planned its land use around proposed Metrorail stations 16 years before the rail system was built. Between 1980 and 2005, population in the Ballston-Rosslyn Corridor increased from 20,000 to 40,000 and employment doubled from 40,000 to 80,000³³. Trips from the five Metrorail stations increased from 57,100 to 83,750 per weekday. Population and employment increased 100%. Rail ridership increased 47%.

U.S. Census “Journey to Work” data for this Arlington Corridor showed:

- Total workers – 26,177
- Drove alone – 10,921 (41.7%)
- Carpooled – 2,137 (8.2%)
- Transit – 9,947 (38%)
- Walked – 2,082 (8%)
- Other – 302 (1.2%)
- Worked from home – 504 (2.9%)

Further, 7% of Arlington households today do not own a car, but rely on transit for most trips beyond walking distance and use zip or rental cars when a car is needed.

Bicycles

“Common use” bicycle programs in the District of Columbia and Arlington are reported to be popular and expanding rapidly. Fairfax County is considering their use for Reston and the future Tysons Corner.

A high percentage of school-aged children bicycled to school in the 1950s. Today, 39% are driven to school in private cars. Where the County can provide safe bicycle paths, separated from vehicular traffic, incentives should be developed for families whose children could ride to school.

County Residents Will Make Their Choices Based on Cost and Convenience

The Ballston-Rosslyn Corridor results show reduced reliance on the automobile for commuting, so the evolution of more TODs in Fairfax should reduce energy consumption by transportation. In the near and mid-term – over the next 20 to 25 years – reduced energy consumption from transportation will be dependent upon:

- Some increased use of transit;
- More fuel efficient vehicles;
- Increased pedestrian and bicycle use;
- New transportation modes and concepts; and *of most significance*
- *Reduced highway congestion.*

Highway and Transit Development

Conventional rail transit is expensive to construct³⁴ and is only possible when right-of-way has been preserved, so significant additional expansion of Metrorail after the Silver Line is unlikely within the County, other than within the I-66 median to Centreville.

³³ These figures were reported to a DATA/DCRA seminar in November 2005 by Dennis Leach, Arlington County’s Director of Transportation.

³⁴ The Silver Line is practical, as the Dulles Corridor was purchased in the late 1950s as part of Dulles Airport, whose planners acquired enough width to provide for local lanes – now the “Toll Road” Route 257, and a median preserved for a rail link.

Over the next 10 to 20 years, most transit systems launched within the County or regionally likely will be road based. This will include Bus Rapid Transit (BRT), trolley, and conventional bus services.

Consequently, most, if not all future transit within the County, will be affected by highway congestion³⁵ for significant portions of the rider's journey. *Due to the need for transit to use highways and the need for most trips in the County to continue to use individual vehicles, a highway improvement program to eliminate, or at least drastically reduce congestion, provides the County with the lowest hanging fruit for transportation energy reduction.*

HOT and HOV lanes can provide semi-dedicated lanes for highway-based transit, but the vehicles still have to contend with growing volumes of congestion within the HOV lanes, and at the termination of HOV and HOT lanes. The I-395 HOT lanes should provide congestion-free travel at a toll that increases with demand to sustain free-flowing levels of traffic until the vehicle exits the HOT lanes.

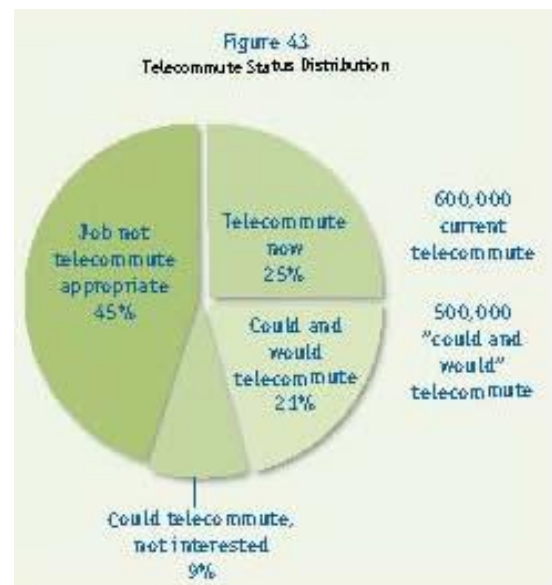
Telecommuting

New work practices that enable telecommuting are helping to reduce congestion, and thus emissions. In 2010, 23.5% of all regional workers were able to telecommute either regularly or occasionally, up from 11% in 2001³⁶. The 2010 result represents approximately 600,000 workers region-wide who have a defined place of work. It does not include those whose home is their place of work.



Table 25
Frequency of Telecommute

Frequency	Percentage
Occasionally for special projects	10%
Less than once per month/emergency	12%
1 - 3 times per month	30%
1 day per week	10%
2 days per week	12%
3 or more times per week	17%
Average (mean) days per week	1.3



³⁵ The Dulles Airport Access Road is an exception, as it currently provides congestion-free travel on a dedicated right-of-way available to transit vehicles.

³⁶ Source: [MwCOG Survey](http://www.mwco.org/commuter2/pdf/publication/2010-StateOftheCommute-Final.pdf) (Pages 47-53)

<http://www.mwco.org/commuter2/pdf/publication/2010-StateOftheCommute-Final.pdf>.

The survey also showed that the higher the salary, the greater the ability to telecommute.

Congestion Related Realities

Quite apart from the direct impact of congestion upon energy use, congestion generates a number of other wasteful societal side effects:

- Congestion reduces the productivity of a school bus and has: a) forced the Fairfax school system to use more buses than a less congested highway system would require; b) by lengthening school bus journeys, caused more parents to drive their children to and from school. Both waste energy. The cost of operating a school bus is equivalent to the cost of a teacher. So, more school buses mean fewer teachers or higher costs.
- The lack of affordable housing close to employment centers first leads to long commutes, and then congestion, as the region had neither properly integrated transportation and land use planning in the past, nor provided the transportation to support the land uses approved by localities. Both waste energy. The congestion then restricts employee availability, leading employers to sometimes move out to sites with better transportation access for their employees, furthering the cycle of sprawl.
- Every product or service we buy involves a truck. Congestion slows deliveries, increases the number of trucks required, as well as delivery costs, fuel burn and emissions. For example, to service its customers in the National Capital Region, Guernsey Office Products requires 15% to 20% more trucks due to congestion to make the same number of deliveries, and has had to build a second distribution center in Maryland due to the extreme level of Potomac bridge congestion. Similarly, utility companies must employ more trucks and staff to service equipment and customers³⁷. Congestion again wastes energy.

The economic, environmental and societal case for eliminating highway congestion in all but dense urban areas is compelling, as the cost of highway congestion is higher than the cost of the cure for households, as well as businesses and governments. Reducing highway energy consumption thus should be a rallying cry for pro and anti-highway interests.

Within Fairfax County, an estimated 38 gallons³⁸ of fuel per capita were wasted in 2004 due to highway congestion, according to regional data published by the Texas Transportation Institute (TTI), the nation's leading authority on the subject, i.e. \$133 per man, woman, and child; \$532 a year for the average family of four with fuel costing \$3.50 per gallon.

Data From Fairfax County Public Schools Parents Surveys

Sixty percent of Fairfax school students able to walk to school, and 39% of those able to use the school bus travel to and fro in a private car. Backpack weight, safety, school bus crowding and journey length, increased sleep, and quality parental time are given as the primary reasons for use of the family car.

Photographs from the 1950s show that a high percentage of students bicycled to school that decade. If more parents found it attractive for their students to walk, bicycle or use the school bus, energy consumption would be reduced. However, as many parents state they drop their children at school on the way to work, the energy saving might not be as large as anticipated. The survey results indicate that safer routes might lead to more students walking or riding a bicycle to school.

³⁷ Dominion Power estimates the cost of sending out a truck to be \$500/trip. Smart meters should reduce the need for truck trips.

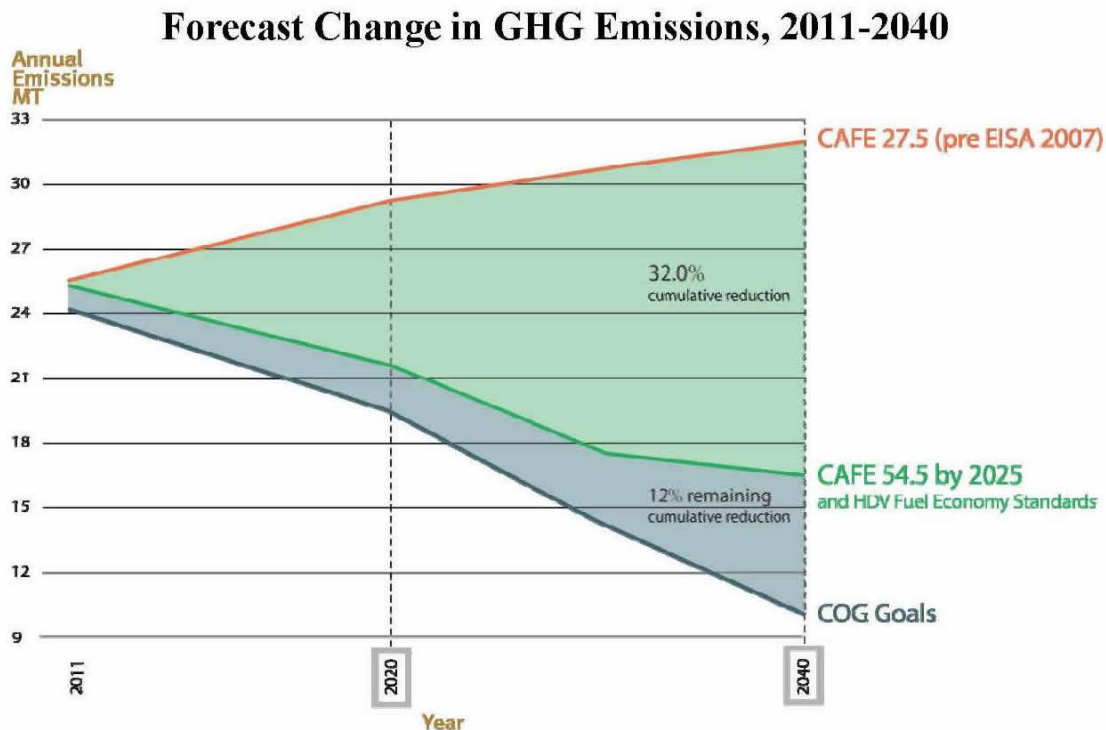
³⁸ TTI reported that the Washington area wasted 162.7 million gallons of fuel in 2004 through highway delays. The Fairfax County population is 24% of the region's population considered in the TTI data.

Vehicle Technology

We can expect to see reduced energy use in transportation due to improvements in vehicle technology. These improvements are driven by industry-wide trends that may not be affected by actions in any one county, but which can be encouraged by the County in concert with its neighbors. These improvements are expected to take a number of forms:

- 1) Increased miles per gallon: The vehicle mix in Fairfax County will reflect higher average MPG as federal CAFE standards are implemented, as well as some increased use of hybrid and electric vehicles over the next decade³⁹. While electric and plug-in hybrid vehicles travel further per unit of fossil fuel than most conventional vehicles, they still consume traditional fuels, either directly or via the power station generating the electricity. As these sources of power gradually transition to renewable and lower carbon fuels, a corresponding further reduction in transportation emissions per mile should occur. *Fairfax County now operates a large number of hybrid vehicles, as their lower fuel consumption produces a lower life cycle cost than conventional vehicles.*

Measure 5.2: GHG Emissions from Mobile Sources



Source: TPB What Would It Take Scenario (WWIT)

Unlike other vehicle emissions, CO₂ does not decay rapidly, so its effect is cumulative.

- 2) Increased use of alternate transportation fuels, which neither compete with food production, nor harm internal combustion engines and their fuel systems: Natural Gas and bio-diesel applied to transit, commercial fleet, off-road, and other vehicles, help minimize harmful emissions⁴⁰ and reduce reliance on conventional petroleum based fuels.

³⁹ This can be expected to further reduce the gas tax revenue available for Metro subsidies.

⁴⁰ FedEx uses bio-diesel for its Washington, DC-based delivery vehicles, and is interested in electric trucks. Some Metro buses and a few cabs use Natural Gas (NG) fuel. The Metropolitan Washington Airports Authority (MWAA) has acquired a Natural Gas filling station to support NG vehicles. Arlington uses an early bio-diesel in its school buses.

- 3) New vehicle and highway technology: 21st century transit and highway systems in which infrastructure and vehicles react together will slowly become more common. This could take the form of individual vehicle transit systems, self-driving vehicles, or new modes. (Current transit is an extrapolation of 19th century concepts, and highways are based on the 20th century transportation paradigm; the goal being to slow the spread of congestion, not to resolve the problem.)

Technologies developed in the late 20th century provide opportunities for entirely new highway and transit concepts that can add capacity, flexibility, and service quality at per mile costs which hold the promise of lower construction and operating costs than traditional rail transit and highways. Fairfax County is monitoring the Personal Rapid Transit systems⁴¹ coming into use in Europe and should aggressively pursue new concepts.⁴² The County should not become a prisoner of the past by limiting its initiatives to only those concepts which are covered by existing government procedures, rules and regulations.

Renewable Transportation Fuel

Longer term, the work currently underway to provide aviation with sustainable bio-fuels can be expected to also provide surface transportation with carbon-neutral or near carbon-neutral renewable fuels at an affordable price.

The USAF, USN and USMC are motivated by energy security, cost, and environmental considerations. The airlines, for whom fuel is 40% of their operating cost, similarly are motivated by supply security, price stability, and by a desire to eliminate GHG emissions for environmental as well as tax reasons. Use of low carbon, drop-in bio-jet fuel for commercial airline services began in June 2011, and since Thanksgiving 2011, Alaska Airlines and Lufthansa have been using a drop-in bio-jet fuel on some flights into the Washington area. For more information on these aviation programs, click on the following link <http://caafi.org/>.

Expanding the supply of renewable transportation fuel to surface transportation will require a significant scaling up of the renewable fuel industry. This is not in Fairfax County's control. However, the County can help bring the fuels to market by being an early adaptor of renewable fuels in its fleets, and provide incentives for the development of new infrastructure that might be needed to deliver the new fuels.

Conclusion and Proposed Transportation Action

Conclusions

- 1) Long-term, it is reasonable for Fairfax County to assume that transportation and fuel developments will result in near carbon-neutral transportation systems by 2040, or shortly thereafter.
- 2) In the short and medium-term, County policies and actions are recommended that reduce congestion and stimulate accelerated use of more fuel efficient, lower carbon transportation, without constraining mobility⁴³ or freedom of choice.

Within Fairfax County and the region, trip regularity as well as trip time is important.

⁴¹West Virginia University's 8-seat automated PRT system built by Boeing as a pilot for the federal government has now operated successfully since 1975. In over 30 years of operation, it has achieved 98.5% reliability. The PRT system has 5 stations, links West Virginia University's three campuses with downtown Morgantown, and carries 16,000 people a day. The town's population is 30,000 residents plus 28,000 university students.

⁴²Such a farsighted move would position the County to attract companies developing new transportation concepts which also can be expected to benefit from the region's highly-educated IT and aerospace workforce.

⁴³Transportation is a means, not an end, and it therefore has a tremendous economic magnifier. People travel and ship goods for the purpose at the other end; they rarely travel for the sake of travel. Collectively, the purpose for these myriad trips, whether commuting or interregional travel, make up the economy. Energy Task Force recommendations should seek to enhance, not constrain economic growth.

Recommendations

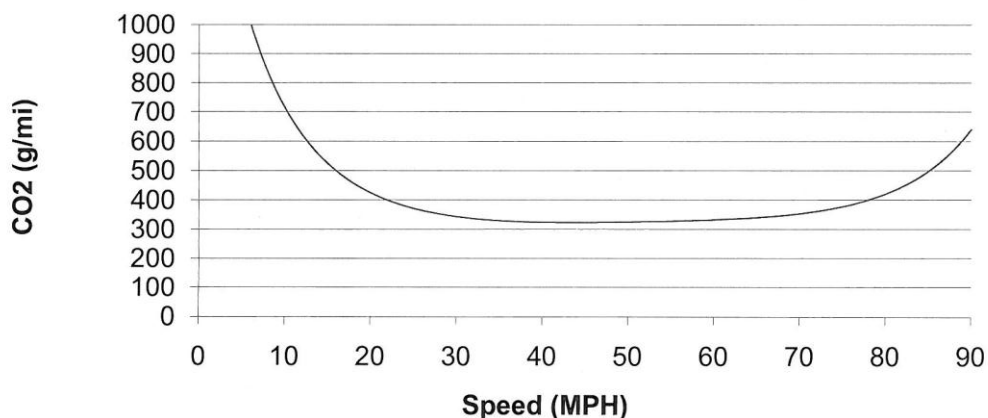
It is recommended that the County act to reduce congestion. The lowest hanging fruit – increased highway efficiency, free-flowing traffic on the County’s road system – constitutes the largest mid and near-term savings available to the County in the use of transportation energy.

Congestion Reduction Recommendations:

- 1) A review of the entire County road system’s use across the day in order to pinpoint bottlenecks by hour and prioritize their elimination using the comprehensive data now available from GPS and cell phone use.⁴⁴
- 2) Expand the capacity of the highway network based on assessments of a proposed improvement’s ability to reduce congestion.
- 3) As most bottlenecks are created by intersections, develop novel methods of speeding intersection flow, such as the use of roundabouts in certain circumstances, and make greater use of innovative limited access techniques.
- 4) Corridor management concepts.⁴⁵ Traffic signal synchronization, now universal across Northern Virginia, has produced as much as a 15% increase in capacity. The County and the region should now go beyond synchronization to manage the traffic flow along major corridors. The widespread use of GPS and cell phone technologies in individual vehicles now makes this a cost effective possibility. (The County is seeking a federal grant to fund a study of the Route 1 Corridor between Huntington Station and Lorton. Ft. Belvoir is an important hub within this corridor. The County also is seeking to become a pilot for VDOT’s “Connected Cars” trial.)
- 5) Develop convenient, all-weather means of expanding the radius of action for rail transit stops to one mile, thus expanding the number of County residents within attractive access of stations to 24% by 2040.

Increasing speed from 10 mph to 30 mph produces a near threefold reduction in CO₂ emissions and a similar increase in fuel efficiency.

CO₂ Emissions Rates by Speed



(Source: UC Riverside – Southern California Data – courtesy of MWCOG.)

⁴⁴ Cell phone and GPS data provides a powerful new tool with which to evaluate traffic flow across the entire road network by time of day. The data does not allow individual cell phone or GPS users to be identified.

⁴⁵ Noblis, based in Fairfax County, has applied this blend of technologies to corridors in Dallas and San Diego.

Consider Incentives

- 1) Consider scaling existing Personal Property taxes on road vehicles by the vehicle's average EPA mileage. Vehicles without a certified EPA mileage would be taxed at the highest level. The intent would be lower taxes for fuel efficient vehicles, balanced by higher taxes for less efficient vehicles, in order to produce a revenue-neutral result. Vehicles 10 years or more in age should be grandfathered.
- 2) Explore the knowledge of highway use available from cell phone and GPS data now available for purchase, to seek a novel incentive.
- 3) Maintenance of federal tax credits for hybrid, electric and other fuel efficient vehicles.
- 4) Parking incentives – convenience and/or cost – for fuel efficient vehicles.

(Carpooling already is incentivized through HOV lanes, guaranteed rides home, etc.)

As mobility – average speed – is directly linked to economic growth or decline, it cannot be overemphasized that County policies should seek reductions in transportation energy consumption per capita through the use of incentives, not restrictions.

Innovation

- 1) Leverage the County's size and diversity to partner with the private sector in the evaluation and application of 21st century highway and transit concepts, new modes etc.
- 2) Adopt simple, rapid procedures for permitting Natural Gas and electric vehicle infrastructure, including electric charging stations and renewable sources of electricity, such as solar for these stations.
- 3) As 20% of congestion is created by police and emergency activity⁴⁶, develop and increase the use of non-invasive, less visible policing methods. (A police motorcycle out of sight in front of a stopped vehicle creates less rubbernecking than a police car with flashing lights, for example.)

Note:

- 1) Transportation solutions have to be achieved in concert with state and local partners.**
- 2) Funding for highway improvements is not discussed here, as the subject was considered to be outside the remit for the Fairfax Energy Task Force.**

⁴⁶ TTI presentation to NVTA.

Section 3

Goals

The goal is to develop energy incentives that can work for the County as well as for the development community.

The County already has set two goals. The Tysons Land Use and Transportation Concept plan calls for Tysons Corner to be carbon-neutral by 2030. Secondly, the “Cool Counties” goal of reducing GHG emissions by 2% per annum over a 2007 baseline represents a 49% reduction by 2040. The Cool Counties initiative was initiated by Fairfax County and has since been merged into the MWCOG regional goal of an 80% reduction in GHG emission by 2050, which the County supports.

Plans do not appear to exist to meet these goals.

At the beginning of its work, the ETF considered a tentative goal of halving the energy consumption of buildings and of making transportation carbon-neutral by 2040. The buildings portion of the tentative goal is in line with the Cool Counties goal of a 2% per annum cumulative reduction. And, based on the CAAFI work to develop cost effective carbon-neutral fuels for aircraft, it is reasonable to believe that surface transportation could be carbon-neutral in 30 years.

In 2006, Fairfax County produced 12 tons of CO₂ per capita. With the Cool Counties and MWCOG 2% per annum goals in place, a carbon neutral goal for Tysons by 2030, and if individual goals for individual areas within the County are established⁴⁷, it would seem entirely feasible to see the County’s GHG emissions reduced from 12 tons to around 3 tons per capita by 2040. To achieve this, however, will require:

- a) Creation of practical plans that can be implemented over the next 30 years;
- b) Sustained public *will* to meet the goals.

The City of Chicago has a detailed plan to achieve by 2030 an 80% reduction in the production of GHG emissions associated with the Chicago Loop. To support implementation of this goal, the City commissioned a sophisticated energy model for its downtown area in order to provide a tool to:

- a) Assist in the evolution of practical plans;
- b) Assess the impact against the plan of proposed changes, whether to policy or individual buildings.

The ETF recommends that Fairfax County similarly develop an energy model for planning purposes, beginning with Tysons Corner. A tool that enables the County to assess change and progress against an established baseline will be vital to the achievement of these or any other goals set. Participation in the Department of Energy challenge by the County could assist with the creation of the desired model.

⁴⁷ If the goals are established without incentives and consensus with landowners, the best intentions would produce unintended adverse consequences.