

Response to Questions on the FY 2009 Advertised Budget Plan

Request By: Supervisor Herrity

Question: What is the estimated cost/cost benefit of participating in the Cool Counties Challenge?

Response: A cost benefit analysis associated with the County's participation in the Cool Counties Challenge is attached.



County of Fairfax, Virginia

MEMORANDUM

TO: Board of Supervisors

FROM: Anthony H. Griffin
County Executive 

SUBJECT: Cool Capital Challenge Cost Benefit Information

DATE: March 31, 2008

Attached is the cost benefit information for the Cool Capital Challenge, Action Item 4 of the March 31, 2008 Board Package.

Attachment A/S

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SUMMARY MATRIX
ACTION – 4 COOL CAPITAL CHALLENGE
MARCH 28, 2008

The summary of actions with associated costs and benefits shown below is included as additional information to Action - 4 regarding the December 3, 2007 Board Matter on the Cool Capital Challenge. Please also see Exhibits A, B, C and D, which provide additional detail regarding Wind Energy Purchase, Hybrid Vehicle Purchase, Tree Planting and Lighting Retrofits and Landfill to Gas Energy, Recycling and Waste to Energy, respectively. If you should have any questions regarding the information provided in the summary matrix or the exhibits, please contact Kambiz Agazi, Environmental Coordinator at kambiz.agazi@fairfaxcounty.gov or 703-324-1788. Thank you.

ACTION	COST	CARBON DIOXIDE (CO ₂) REDUCTION	COMMENTS/EMISSION REDUCTION BENEFITS
1 - Teleworker	Agency budget	0.82 tons per year (tpy)	Oxides of Nitrogen, Hydrocarbons and Carbon Monoxide http://www.epa.gov/climatechange/emissions/ind_calculator.html http://www.epa.gov/oms/consumer/f00013.htm
1 – 2 to 2.5 inch caliper tree	\$300 - \$435 per tree (includes installation plus maintenance)	0.17 tpy	Please see Exhibit C
Wind Energy Year 1	5,800,000 kWh (\$130,500)	5,559 tpy	Oxides of Nitrogen, Sulfur Dioxide, Carbon Monoxide, Mercury, Particulate Matter (Please see Exhibit A)
Wind Energy Year 2	7,250,000 kWh (\$163,250)	6,949 tpy	Oxides of Nitrogen, Sulfur Dioxide, Carbon Monoxide, Mercury, Particulate Matter (Please see Exhibit A)
Wind Energy Year 3	11,600,000 kWh (\$261,000)	11,119 tpy	Oxides of Nitrogen, Sulfur Dioxide, Carbon Monoxide, Mercury, Particulate Matter (Please see Exhibit A)
12 – Ford Escape Hybrids	\$26,947 per vehicle (19,318 per vehicle for non-hybrid version)	26 tpy	\$650/yr savings in gasoline per vehicle based on today's gas price, Oxides of Nitrogen, non-methane organic gas, volatile organic compounds and carbon monoxide (Please see Exhibit B)
Providence RECenter Lighting Upgrades	\$70k - \$100k (Annual cost avoidance savings are estimated at \$60k per year based on 15% reduction in today's electricity costs).	59 tpy	Please see Exhibit C

SUMMARY MATRIX
 ACTION – 4 COOL CAPITAL CHALLENGE
 MARCH 28, 2008
 CONTINUED

ACTION	COST	CARBON DIOXIDE (CO ₂) REDUCTION	COMMENTS/EMISSION REDUCTION BENEFITS
Connector Bus Operations	39.7 million approved in fiscal year 2008 budget	54,000 tons per year	Oxides of Nitrogen, Carbon Monoxide, NMOG and Volatile Organic Compounds
County Recycling Operations	Cost information regarding the county's recycling operation will be made available at the Board of Supervisors' on March 31		Please see Exhibit D

Fairfax County Wind Energy Purchase			
April 1, 2007 to March 31, 2010			
	Quantity		
	<u>kWh</u>	<u>Price</u>	<u>Cost per kWh</u>
Year 1	5,800,000	\$130,500	\$0.0225
Year 2	7,250,000	\$163,250	\$0.0225
Year 3	11,600,000	\$261,000	\$0.0225
Total	24,650,000	\$554,750	\$0.0225

Fairfax County Wind Energy Purchase				
Emission Reductions by Major Pollutant				
April 1, 2007 to March 31, 2010				
	Quantity			
	<u>kWh</u>	<u>CO₂</u>	<u>NO_x</u>	<u>SO₂</u>
		Tons	Tons	Tons
Year 1	5,800,000	5,559	6	19
Year 2	7,250,000	6,949	8	23
Year 3	11,600,000	11,119	12	37
Total	24,650,000	23,627	26	79

Cost differential between hybrid and non-hybrid equiv. Ford Escape plus emissions and gasoline reduction benefits including NOx, SO₂, CO₂ and gallons/year with average gas price to show economic benefit.

Projections based on EPA and county fleet data for vehicles already in the fleet

CY 2007 Virginia state contracts (expired 12/16/07)

Purchase prices on VA state contracts (CY 2007, base price, 4WD, no options):

MY 2007-2008 Ford Escape Hybrid: **\$26,947.00**

MY 2007-2008 Ford Escape (non-hybrid, 3.0L engine, prior to 12/17/07)¹: **\$19,317.60**

Regulated pollutants – EPA emissions certifications² gm/mi:

<u>Model Year 2008</u>	Escape Hybrid 4WD \$26,947	Escape 4WD (3.0L) \$19,317.60
EPA Tier 2 Certification	Bin 3	Bin 5
NOx – 50K mi	0.01	.02
NOx – 120K mi	0.01	.03
NMOG – 50K mi	0.01	.044
NMOG – 120K mi	0.01	.074
CO – 50K mi	0.1	0.3
CO – 120K mi	0.1	0.5

Fuel Economy – Fairfax County (limited) experience with MY 2008 Escape Hybrid and Escape (non-hybrid, 3.0L engine):

	Escape Hybrid 4WD	Escape 4WD (3.0L)	Net improvement (hybrid over non-hybrid)
Fuel economy, mpg ³	26.5	17.9	
Projected annual fuel use, gal. (12,500 mi)	472	698	226
Projected annual fuel cost (\$2.8744/gal ⁴)	\$1357	\$2007	\$650
Projected annual CO ₂ emissions, lb. (19.4 lb CO ₂ /gal)	9,157	13,541	4,384

¹ Fairfax County has one MY 2008 Escape (non-hybrid, 3.0L engine) purchased under the 2007 state contract.

² SO₂ is not regulated in vehicle emissions. No standard is set and certification data do not include it.

³ Based on four 2008 Escape Hybrids and one 2008 Escape (non-hybrid). The fleet also has two 2007 Escapes (non-hybrid), which averaged 17.6 mpg in CY 2007.

⁴ Fuel cost to DVS as of 3/17/08, plus \$0.12 markup. This rate is used rather than the last 12-month average because fuel prices have been on a generally steady upward trend with no indication of significant decline in the near future.

Projection based on EPA data only, for vehicles entering the fleet

CY 2008 Virginia state contracts

Purchase prices on VA state contracts (CY 2008, base price, 4WD, no options):

MY 2008 Ford Escape Hybrid: **\$26,745.00**

MY 2008 Ford Escape (non-hybrid, 2.3L engine, beginning 12/17/07)⁵: **\$16,556.60**

Regulated pollutants – EPA emissions certifications⁶ gm/mi:

Model Year 2008	Escape Hybrid 4WD \$26,745	Escape 4WD (2.3L)⁷ \$16,556.60
EPA Tier 2 Certification	Bin 3	Bin 5
NOx – 50K mi	0.01	0.02
NOx – 120K mi	0.01	0.04
NMOG – 50K mi	0.01	0.028
NMOG – 120K mi	0.01	0.05
CO – 50K mi	0.1	0.4
CO – 120K mi	0.1	0.7

Fuel Economy – EPA certification for MY 2008 Escape Hybrid and Escape (non-hybrid, 2.3L engine)⁸:

	Escape Hybrid 4WD	Escape 4WD (2.3L)	Net improvement (hybrid over non-hybrid)
Fuel economy, mpg	28	21	
Projected annual fuel use, gal. (12,500 mi)	446	595	149
Projected annual fuel cost (\$2.8744/gal ⁹)	\$1282	\$1710	\$428
Projected annual CO ₂ emissions, lb. (19.4 lb CO ₂ /gal)	8,652	11,543	2,891

⁵ Fairfax County has one of these vehicles on order as of 3-27-08.

⁶ SO₂ is not regulated in vehicle emissions. No standard is set and certification data do not include it.

⁷ The 4-cylinder, 2.3L engine is the only engine offered in the non-hybrid Escape on the Virginia state contract beginning Dec. 17, 2007. Before that date, Fairfax County bought non-hybrid Escapes with the 3.0L engine on the state contract. We expect the 2.3L non-hybrid to be less similar in driving performance to the Hybrid than the 3.0L was, although it will likely be satisfactory for most missions.

⁸ EPA-certified fuel economy is derived from testing over a standard driving profile intended to represent nationwide driving patterns. Fairfax County generally experiences fuel economy lower than the EPA-certified levels. Proportionally lower fuel economy in both vehicles would return a greater fuel (and therefore also CO₂) saving than that based on the EPA fuel economy.

⁹ Fuel cost to DVS as of 3/17/08, plus \$0.12 markup. This rate is used rather than the last 12-month average because fuel prices have been on a generally steady upward trend with no indication of significant decline in the near future.

Providence RECenter Lighting System

Lighting System	Number of Lamps	Average Watt for each lamp	Total watts
T8 Fluorescent Lamps & Electronic Ballast	218	32	6976
T12 Fluorescent Lamps & Electronic Ballast	273	34	9282
Incandescent Exit Signs	9	12	108
LED Exit Signs	9	2	18
400w Metal Halide Lamps	98	400	39200
360w Metal Halide Lamps	8	360	2880
Incandescent Lamps	54	100	5400
Compact Fluorescent Lamps	41	25	1025
Total Watt			64889
Average hours a month this lighting will be used			500
Total KWh a month			32445
Total KWh a year			389334

Annual CO2 Reduction by Planting Trees in Park Authority by efforts between 4/20/07 and 10/1/08	
Number of trees planted	482
Pounds CO2 reduction by planting each average tree	330
Total annual pounds CO2 reduced by tree planting in Park Authority	159060
Assumptions:	
1. Each year, the average yard tree cleans 330 pounds of carbon dioxide from the atmosphere. (Source: http://www.birdday.org/resources/factsheetaudubonwhatyoucando.pdf)	
CO2 Reduction by using synthetic turf in athletic fields (4/20/07 to 10/1/08)	
Total hours a year for mowing athletic fields	440
Gallons of gas consumed per hour by lawn mower	1
Pounds CO2 reduction per gallons of gas reduction	20
Total annual pounds CO2 reduced by using synthetic turf in Park Authority	8800
Assumptions:	
1. One gallon of gas saving keeps 20 pounds of carbon dioxide out of atmosphere (Source: http://www.birdday.org/resources/factsheetaudubonwhatyoucando.pdf)	
2. We assumed that gas consumption by mowing machine for athletic fields is one gallon per hour	

CO2 Reduction for Providence RECenter lighting system by planned efforts before 10/1/08	
Annual KW consumed in providence RECenter lighting system (see Providence worksheet)	389334
Expected KW saving by implementing planned project	15%
Pounds CO2 reduction per KWh electricity consumption reduction	2
Total annual pounds CO2 reduced by lighting update plan	116800
Assumptions:	
1. One KWh electricity saving keeps 2 pounds of carbon dioxide out of atmosphere (Source: http://www.cleanerandgreener.org/resources/emission_reductions.htm)	
2. We assumed that saving electricity consumption by Providence RECenter lighting system will be 15 percent	

Cool Capital Challenge Data

	Activity	Factor	Total Number of Units	Equiv. CO2 Reduction/Year (tons)	Comments
1	CFI Supplemental Power Project	<i>Tons of CO2 released through combustion of diesel fuel, per MWh</i> 0.769	<i>Avoided MWhrs</i> 12,000	9,222	Project under feasibility study
2	Landfill Gas-to-Energy Projects I-95 Phase I (3MW)	<i>Tons of CO2 Equivalent (TCE) destroyed per cubic foot of methane combusted</i> 0.00045	<i>Landfill Gas Processed Daily In Cubic Feet</i> 1,656,000	134,739	
	I-95 Phase II (3MW)	<i>TCE destroyed per cubic foot of methane combusted</i> 0.00045	<i>Landfill Gas Processed Daily In Cubic Feet</i> 1,656,000	134,739	
	I-95 Phase III (direct use)	<i>TCE destroyed per cubic foot of methane combusted</i> 0.00045	<i>Landfill Gas Processed Daily In Cubic Feet</i> 1,100,000	89,500	
	I-95 Space Heat	<i>TCE destroyed per cubic foot of methane combusted</i> 0.00045	<i>Landfill Gas Processed Daily In Cubic Feet</i> 21,120	722	
	I-66 Space Heat	<i>TCE destroyed per cubic foot of methane combusted</i> 0.00045	<i>Landfill Gas Processed Daily In Cubic Feet</i> 213,760	7,305	Project under construction
	TOTAL FOR LFG PROJECTS			367,004	
3	CFI Over 80 OPS	<i>Tons of CO2 released from coal combustion per MWh</i> 0.582	<i>MWhrs per year (2 MW, 80% availability)</i> 14,016	8,157	Awaiting FERC and SCC approval
4	Hybrid Vehicles	<i>TCE avoided per 1000 miles driven</i> 0.377	<i>Hybrid Miles Driven/Year</i> 12,000	5	
5	Teleworkers	<i>TCE avoided per year</i> 0.52	<i>Number of Teleworkers</i> 11	6	
6	Recycling	<i>TCE avoided per ton of waste recycled</i> 0.871	<i>Tons recycled in CY2007</i> 498,139	433,793	
7	Transfer Station vs. Collection Vehicle Miles	<i>TCE Released per mile driven</i> 0.0021	<i>Miles Avoided Annually:</i> 2,417,854	5,071	
8	Energy / Resource Recovery versus Landfilling	<i>TCE avoided per ton of waste processed</i> 0.165	<i>Tons Processed Per Year:</i> 1,050,000	173,614	

GRAND TOTAL, TCE REDUCED/AVOIDED - ACTIVE PROJECTS ONLY

972,187

Emission Factor References:

- 1 Energy and Environmental Analysis, Inc. "Environmental Benefits of Distributed Generation"
- 2 Michigan Cogeneration Systems, www.landfillenergy.com
- 3 Energy Information Administration, "Updated State-Level Greenhouse Gas Emission Coefficients for Electricity Generation", April 2002
- 4 www.consumerenergycenter.org/transportation/hybrids/index.html
www.epa.gov/otaq/climate/420f05003.htm#vehicle
- 5 <http://www.teleworkexchange.com/teleworker-07-05.asp>
- 6 USEPA, "Solid Waste Management and Greenhouse Gases, 3rd ed., September 2006"
- 7 www.epa.gov/appdstar/pdf/brochure.pdf
www1.eere.energy.gov/vehiclesandfuels/pdfs/deer_2004/session6/2004_deer_kodjak.pdf
- 8 USEPA, "Solid Waste Management and Greenhouse Gases, 3rd ed., September 2006"

Addendum to Exhibit D

- * Landfill Gas to Energy, 4,400,000 cubic feet/day – 367,004 tons/year

In order to recover landfill gas (LFG) for use as energy, the County spends approximately \$150,000 per year maintaining LFG extraction wellfields at its closed landfills. It is important to note that the installation of these wellfields is a mandatory environmental protection requirement. However, the recovered LFG, which could simply be flared, is instead used by a private sector company who pays \$120,000 per year for the gas rights.

GHG emission reductions are based on the estimated methane emissions that are avoided by the controlled combustion and energy recovery process, which also offsets energy produced by fossil fuel combustion. It should be noted that methane is a potent GHG, with a global warming effect that is 20 times greater than CO₂.

- * Waste to Energy, 1,050,000 tons processed/year – 173,614 tons/year

In order to annually process over 1.0M tons of refuse at the waste-to-energy (WTE) plant, the County pays Covanta approximately \$35M per year in tipping fees. However, it is important to note that the County must also provide approximately \$20M per year in additional infrastructure and programs that complement or support the WTE plant. These additional services include the transfer station, and recycling operations described elsewhere, and also scalehouse and invoicing systems, hazardous and other unacceptable waste control programs, code enforcement and inspection resources, and solid waste management planning support. All of these additional support efforts are business necessities and/or regulatory mandates.

GHG emission reductions are calculated using a USEPA-published estimating factor for communities which use WTE as an alternative to landfilling. It should be noted that considerable debate is underway within the scientific community, as some experts contend that this factor greatly underestimates the GHG benefits of WTE.

- * Transfer Station Operations, 2,400,000 miles avoided/year – 5,071 tons/year

In order to minimize traffic and provide an economical means for waste disposal to the northern half of the County, the County spends approximately \$13,000,000 per year to operate a Citizen's Disposal Facility, a yard waste management program, and a solid waste transfer station at the I-66 complex. The transfer station operation cuts traffic to-and-from the Lorton site by at least half, and controls the cost of waste hauling by using over-the-road tractor-trailer rigs. The transfer station also offers County residents the opportunity to recycle and to properly manage wastes that are unsuitable for the WTE process (e.g., household hazardous waste).

GHG emission reductions are based on the estimated trip miles that are avoided by consolidating multiple collection vehicle loads into a single transfer trailer (rather than having every neighborhood collection vehicle drive all the way to Lorton at the end of the work day). Mileage avoided is converted to GHG emission reductions, based on estimated vehicle fuel savings (and thus, emission reductions).

- * Recycling, 498,000 tons/year – 433,793 tons/year

The annual recycling of almost half-a-million tons of waste per year is accomplished using a combination of County regulations and private-sector and County resources that serve the community. While the majority of the County's residents and businesses are served by private sector haulers, the County provides collection services in sanitary districts. The net cost to the County for solid waste management code compliance, operation of recycling drop off centers, and providing education, outreach, and technical assistance services related to recycling to every County resident, business, and institution is approximately \$2,100,000 per year. Further, it is important to note that the County is required by State law to recycle a minimum of 25 percent of the solid waste stream generated in the County, and that the WTE plant could not manage all of the County's waste stream without its active and successful recycling program.

GHG emission reductions are calculated using a USEPA-published estimating factor for communities which recycle as an alternative to landfilling.