2011 – 2012
Strategic Energy Plan

N.C. Department of Environment and Natural Resources

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Executive Summary

This overall Strategic Energy Plan (SEP) for the N.C. Department of Environment and Natural Resources was developed in accordance with General Statute 143-64.10 - 12 'Energy Conservation in Public Facilities,' which mandates a comprehensive energy management program for state government. It is in support of the State Utilities Savings Initiative (USI), established by the Governor's Efficiency Commission. Energy consumption per gross square foot is to be reduced by 20 percent by 2010 and 30 percent by 2015 compared to the base fiscal year, 2003-2004. Consumption of electricity and heating fuel has decreased by 20% from the baseline year of 2003-2004 on a square footage basis.

For FY 2012, DENR underwent a reorganization. The Divisions of Forest Resources and Soil and Water Conservation were moved to the Department of Agriculture and Consumer Services. The Division of Environmental Health was abolished, with some programs transferred to other DENR divisions, and programs that are implemented through local health departments transferred to the Department of Health and Human Services (DHHS) Division of Public Health.

This reorganization reduced DENR building area by approximately 623,400 square feet, which is a 20% reduction in area from FY 2011. The cost of all utilities in FY 2012 was $4.4 million, which is a 22% spending reduction from FY 2011.

DENR leadership recognizes the greatest benefits of any department-wide Strategic Energy Plan will come at the division office and facility levels. DENR divisions are extremely diverse and complex in their missions and locations across the state, yet many DENR divisions have actively worked to save energy and water through their individual programs and in projects unique to individual facilities.

This overall DENR plan tracks and reports general DENR performance and highlights major activities and accomplishments of its divisions:

- DENR divisions that have large utility usage, such as the Aquariums and Zoo, separately submit annual Strategic Energy Plans to the State Energy Office, but are also included in the overall DENR reporting of energy and water consumption.
- Other large users, including the divisions of Parks and Recreation, Marine Fisheries and Water Quality, received $1.2 million in American Recovery and Reinvestment Act (ARRA) funds to implement projects to retrofit buildings for energy efficiency. The ARRA portion of these projects was completed in December 2011.
- Policies were implemented in FY 2009-2010 regarding meter verification and monitoring of energy and water invoices.
    - Several divisions have verified meters associated with their utility accounts, including the Zoo, Aquariums, and Marine Fisheries.
    - DENR implemented a new utility data tracking system during FY 2012, which requires each Division to report monthly utility use and cost in a spreadsheet. The Division of Parks and Recreation (DPR), which maintains 58% of the total building area of DENR, implemented its own web-based utility tracking system that allows DPR personnel located at each park/recreational area to enter monthly utility and fuel purchase data directly into the database.
    - These new tracking systems should assist DENR to: 1) reduce errors from data entry and double counting, 2) reduce the time to process data, 3) indicate which accounts should be investigated for high use or rates, and 4) assist in defining projects to reduce energy.

Key strategies in the five-year plan to meet the 30 percent reduction goal by 2015:

TASK	STRATEGY
Implement projects at high consuming buildings.	Identify top 20 facilities and appropriate projects.
	Prioritize projects within R&R funds, grants, and performance contracts.
	Conduct energy audits (no cost/low cost) at high energy-using facilities.
	Consider performance contracts at selected facilities.
Achieve behavior changes through policy changes, education and outreach.	Implement Sustainable Living and Green Square Complex policies throughout the department.
	Conduct outreach activities using bulletins, posters, and training methods to create employee awareness.
Policy 1 success	Provide ongoing support on spreadsheet system for tracking energy and water invoices.
Policy 2 success	Provide ongoing support to divisions regarding energy and water meter verification.

DENR Overall Utility Performance

As of January 1, 2012, DENR owns approximately 1,500 buildings having a total area of 2.5 million square feet under roof. During Fiscal Year 2012, DENR spent more than $4.3 million dollars in electricity, heating fuel, and water. Consumption of electricity and heating fuel has decreased by 20% from the baseline year of 2003-2004, on a square footage basis.

Reorganization Impacts

The DENR reorganization reduced DENR building area by approximately 623,400 square feet, which is a 20% reduction in area from FY 2011. The cost of all utilities in FY 2012 was $4.4 million, which is a 22% cost reduction from FY 2011. In FY 2012, DENR reduced its energy use by 31,000 MMBtu from FY 2011, which is a 16% reduction in energy use. Most of this reduction is due to the reorganization; however, a small portion is due to energy efficiency measures implemented by DENR.

While the departure of Forest Resources, Soil and Water Conservation and Environmental Health reduced building square footage by 20%, it only reduced energy use by approximately 10%. This is due to the high energy use by the Aquariums, Parks and Recreation, and the Zoo, compared to buildings we lost. As a result, DENR's energy use per square foot has increased to approximately 64,745 Btu per square foot. DENR believes this increase in energy use intensity is due to better tracking of consumption data and the restructuring, as discussed above. Because the State Energy Office normalizes the energy use calculation by dividing total energy consumption by the total building area, it was not necessary to adjust the 2003-2004 baseline.

Now that DENR has reorganized and is tracking its energy use more directly through monthly tracking sheets, we can establish FY 2012 as a new benchmark for meeting goals in reducing our consumption of energy and water. This benchmark will be used internally to track improvements in our energy use. To track improvements for State Energy Office reporting, DENR will continue to use our 2003-2004 baseline year factors for energy and water use per square foot. DENR hopes to achieve additional reductions in energy usage after planned building retrofit and energy efficiency projects are fully implemented.

Table 1: DENR Overall Utility Performance

YEAR	TOTAL UTILITY COST $	TOTAL DENR BUILDING Sq. Ft.	$ / Sq. Ft.	% CHANGE, from base year
2003–2004	$3,722,825	2,291,088	$1.62	Base year
2004–2005	$4,088,373	2,350,872	$1.74	7%
2005-2006	$4,363,363	2,648,084	$1.65	1%
2006–2007	$4,781,531	2,750,256	$1.74	7%
2007–2008	$5,028,517	2,811,818	$1.79	10%
2008–2009	$5,140,428	2,953,293	$1.74	7%
2009–2010	$5,438,038	3,005,865	$1.81	11%
2010-2011	$5,602,805 [1]	3,113,955	$1.80	11%
2011-2012	$4,382,937 [2]	2,490,567 [2]	$1.76	8%

[1] Adjustment due to double counting in original data submitted to SEO
[2] Decrease in energy costs and square footage due to DENR reorganization

Table 2: DENR Energy Performance

	ELECTRICITY		NATURAL GAS, PROPANE, AND FUEL OIL		COST FACTORS AND % CHANGE FROM PREVIOUS YEAR				
YEAR	ANNUAL USE (million Btu)	ANNUAL COST ($)	ANNUAL USE (million Btu)	ANNUAL COST ($)	$/Building Sq. Ft.	$/million Btu	% Change $/million Btu	Btu/Sq. Ft.	% Change Btu/Sq. Ft.
2003–2004	-	-	-	-	1.42	17.68	Base year	80,573	Base year
200 –2005	-	-	-	-	1.52	20.48	16%	74,426	-8%
2005-2006	-	-	-	-	1.44	22.43	27%	64,398	-20%
2006–2007	-	-	-	-	1.52	22.78	29%	66,912	-17%
2007–2008	104,378	3,283,914	61,527	1,113,788	1.56	26.51	50%	59,003	-27%
2008–2009	123,252	3,581,579	66,308	935,506	1.53	23.83	35%	64,186	-20%
2009–2010	113,809	3,501,283	75,276	1,297,384	1.60	25.38	44%	62,905	-22%
2010-2011	114,559	3,626,383	77,910 [1]	1,316,812 [1]	1.59	25.68	45%	61,808	-23%
2011-2012	**108,594**	**2,933,818**	**52,658**	**842,464**	**1.52**	**23.42**	**32%**	**64,745**	**-20%**

[1] Adjustment due to double counting in original data submitted to SEO

Table 3: DENR Water Usage

			COST FACTORS AND % CHANGE FROM PREVIOUS YEAR			
YEAR	ANNUAL USE (mGal)	ANNUAL COST ($)	$/mGal.	% Change $/mGal.	Gals/Sq. Ft.	% Change Gal/Sq.Ft.
2003–2004	73,476	$459,230	6.25	Base year	32.07	Base Year
200 –2005	66,032	$504,322	7.64	22%	28.09	-12%
2005-2006	67,523	$538,243	7.97	28%	25.5	-20%
2006–2007	66,754	$589,827	8.84	41%	24.27	-24%
2007–2008	59,418	630,815	10.62	70%	21.13	-34%
2008–2009	59,893	623,343	10.41	67%	20.28	-37%
2009–2010	58,787	639,371	10.88	74%	19.56	-39%
2010-2011	74,517	659,609	8.85	42%	23.93	-25%
2011-2012	59,556	606,655	10.19	33%	23.91	-15%

Supply Side Management

Strategy

a. Review all accounts with utility providers to ensure lowest cost rate schedule is in effect for each facility.
b. Identify locations, meter ID and account numbers for all existing primary meters.
c. Implement department-wide system for accurate data collection and review.
d. Accurate data management and analysis of electricity, fossil fuels and water usage, with monthly review of trends and costs.

Tactics

ACCOMPLISHMENTS - Past 12 months Activities	Measurement Expected	Actual	Savings Expected	Actual	Investment	Assigned to	Funding Source
Continued to implement policy to record energy consumption values through reports of invoices paid by Accounts Payable staff.	Monthly automated reports: kwh, gals, THMs		NA		NA	DENR Controller's Office	Salary
Continued data management system to track results of energy reduction strategies.	Biannual analysis of energy usage, costs, and carbon emissions		NA		NA	Air Quality	Salary
Developed internal carbon footprint report.	1 per year		TBD		NA	Air Quality	salary
Continued to implement policy requiring utility billing to be checked for accuracy.	monthly trends analysis at division level		TBD		2 hrs. per month	Controller's Office, Division Business Officers, DAQ	salary
Refined and continued to implement policy requiring utility meter verification and rate verification for major users.	One time review of meter locations, functionality, etc.		TBD		TBD	Division's facility management team	salary
Supported staff member contributing expertise as an advisor regarding DENR utility management	$, KWH		TBD		TBD	Deputy Secretary	Salary
Identified top 20 energy-consuming facilities. Prioritize projects with R&R funds and grants.	$, KWH		TBD		TBD	Air Quality, Environmental Assistance	R&R, grants

Supply Side Management (cont.)

GOALS - Next 12 months Activities	Measurement Expected	Actual	Savings Expected	Actual	Investment	Assigned to	Funding Source
Continue to implement policy to record energy consumption values through invoices paid by Accounts Payable staff; generate automated reports.	Monthly automated reports: kwh, gals, Btu		NA		NA	DENR Controller's Office	salary
Continue data processing and data management system and tracking the results of energy reduction strategies.	Biannual analysis of energy usage, costs, and carbon emissions		NA		NA	Air Quality	salary
Produce internal carbon footprint report.	1 per year		TBD		NA	Air Quality	salary
Identify top 20 energy-consuming facilities. Conduct energy audits on these facilities. Prioritize projects with R&R funds, grants.	$, KWH		TBD		TBD	Air Quality, Environmental Assistance	R&R, grants, perform-ance contracts
Continue to implement policy requiring utility billing to be checked for accuracy.	monthly trends analysis at division level to identify billing errors, outliers, rate problems, etc.		TBD		2 hrs. per month	Controller's Office / Division Business Officers/ DAQ	salary
Continue to implement policy requiring utility meter verification and rate verification for major users.	One time review of meter locations, functionality, etc.		TBD		TBD	Division's facility management team	salary
Support staff member as advisor regarding DENR utility management.	$, KWH		TBD		TBD	Deputy Secretary (Michael Shelton)	Salary

Demand Side Management

DENR applies sustainable building practices in all major facility construction and renovation projects. DENR'S Green Building Policy requires DENR agencies to use sustainable and green building practices, including Leadership in Energy and Environmental Design (LEED), wherever feasible and practical.

Green Square

The Department of Environment and Natural Resources and one of its divisions, the Museum of Natural Sciences (MNS), completed two new buildings as part of the new Green Square Complex in downtown Raleigh in the Fall of 2011 and the Spring of 2012. The Green Square Complex is a multi-use development that brings many of the state's environmental offices located in Raleigh together with a nationally significant Nature Research Center. The DENR building is on track to be Platinum LEED-certified with energy efficiency rated 38 percent better than the ASHRAE 90.1 energy standard. The Nature Research Center is on track to be Gold LEED-certified with energy efficiency rated 33 percent better than the ASHRAE 90.1 energy standard. Both buildings will reduce water use by at least 70 percent through recycling, storm water reuse and high efficiency water fixtures.

New Buildings Are "Green" at State Parks

The Division of Parks and Recreation pursues LEED certification for all new, or significantly renovated, buildings having 5,000 SF or more. For buildings less than 5,000 SF, project team members are required to be familiar with and to use the LEED checklist as a tool to guide the project. All park projects are designed and built using technologies that address the following: ecological site design, transportation, waste reduction, on-site management of sewage or organic waste, energy efficiencies, renewable energy, water efficiency, materials and resources, indoor air quality and operations and management. To date the Division has 6 LEED certified projects, of which 4 have achieved Gold and 2 have achieved Certified.

In FY 2011-2012, Parks and Recreation completed the Cliffs of the Neuse State Park Visitor Center and the Pettigrew State Park Maintenance Facility. Both projects achieved LEED Certification; Gold for the Visitor Center and Certified for the Maintenance Facility. The Gorges State Park Visitor Center is under construction and is expected to achieve LEED Gold once construction is completed in September 2012. Currently under design are the Lake Norman State Park Visitor Center and West District Office, with LEED Gold as the goal. These facilities are being designed as one two-story facility with the Visitor Center housed on the top level and the West District Offices housed on the bottom level.

Other LEED Projects within DENR

The LEED Council officially commissioned the North Carolina Aquarium Pier at Nags Head, AKA Jennette's Pier, at the Platinum level, a considerable achievement for a State facility, and more so for an ocean fishing pier. Three Bergey Excel-S wind turbines fulfill nearly half the facility's annual electric needs. One of the Pier's shade pavilions is covered in photo-voltaic cells that convert sunlight into electricity, which is stored in a battery bank until needed to power Pier lights at night. Besides on-site energy production, the Pier is designed for energy efficiency and resource conservation. A closed-loop, geothermal, HVAC system conditions the pier house. Eighty wells 200 feet deep circulate fluid that returns to the building at a consistent temperature to aid heating in winter and cooling in summer. Water conservation is of particular interest. Rainwater cisterns provide irrigation, deck wash-down and vehicle cleaning. An on-site wastewater treatment facility returns reclaimed water to the Pier and bathhouse toilets. Together, these two features are projected to reduce municipal water use by 60 to 80 percent.

Demand Side Management

Strategy

a. Prioritize energy conservation activities as low, no-cost or capital, and identify / leverage potential funding sources and incentive programs.
b. Apply sustainable building practices in all major facility construction/renovation projects.
c. Utilize replacement strategy that considers life cycle cost analysis, simple payback, and increased efficiency.

Tactics

ACCOMPLISHMENTS - Past 12 months Activities	Measurement Expected	Actual	Savings Expected	Actual	Investment Jobs	Assigned to	Funding Source
Water Quality Chemistry Lab at Reedy Creek -calibrate air flow in fume hoods, re-commission HVAC, Correct insufficient air flow problem, Install lower drop ceilings, insulation, lowering sprinkler heads, ductwork and new lighting.	Kwh, Btu	$	$120,000 3 trillion Btus; 18,245 therms; 357,260 kwh	$25,000 for partial year of electric	$1,205,973 (ARRA); $982,000 (R&R)	Water Quality	SEO (ARRA); R&R
Haw River State Park- Replace lighting in Gymnasium with energy efficient lighting.	Kwh		5,387 kwh	$13,879 in 7 months	$13,915	Parks and Recreation	SEO (ARRA); PARTF
Haw River State Park/Youth and Admin Building-Motion Detection on lighting in (8) Restrooms	Kwh		TBD	$26,000 in 7 months	$2,000	Parks and Recreation	PARTF
DPR replaced all old water heaters, urinals, toilets, etc. with energy/water saving equipment when possible.	$, Kwh, Gallons				Routine Maintenance Cost, Day to Day Operations	Parks and Recreation	PARTF
Funding for Replacement of chilled water system at Rocky Coast	$, kwh	funded	40%	On line 12/2012	$686,000	Zoo	R&R

Demand Side Management (cont.)

GOALS - Next 12 months Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Investment	Assigned to	Funding Source
Replace air handler units in Air Quality and Water Quality labs with energy efficient units.	$, kwh				$237,000	Water Quality and Air Quality	R&R from previous project
Air and Water Quality Labs Joint – Replace air handling units for two buildings.	Kwh, Btu				$164,800	Water Quality and Air Quality	R&R from previous project
Install drop ceilings in Air Quality lab building; add insulation	$, kwh				$70,000	Air Quality	Applied for R&R
Haw River State Park/Env. Ed. Center- Replace existing waste water discharge package plant with new drain field type facility.	$488 & 4236 kwh/ month		$62 & 538 kwh/ month		TBD	Parks and Recreation	PARTF
Fort Macon bathhouse renovations, including possible wind power	$, kwh					Parks and Recreation	R&R awarded
HVAC chiller replacement with more energy efficient unit	$, kwh				$161,000	Marine Fisheries	R&R awarded
Replace elevator with a modern, energy efficient unit.	$, kwh				$172,000	Marine Fisheries	R&R awarded
Replace the failing animal life support system in Graveyard of Atlantic exhibit with 3 variable speed, energy efficient pumps.	$, kwh				$279,000	NC Aquarium at Roanoke Island	R&R awarded
Install 180 ton air cooled chiller with back-up primary and secondary chilled water pumps.	$, kwh				$382,000	NC Aquarium at Pine Knoll Shores	Capital investment when funds available
Modify mechanical systems to reduce energy use in Zoo Desert Pavilion (ventilation, dehumidification, heating & cooling)	$, kwh		25-40%		$318,000	Zoo	R&R
Campus electrical load study; energy efficient equipment in communication center; HVAC use reduction in shop	$, kwh		TBD		$25,000; $106,550; $229,942	Marine Fisheries	Applied for R&R

GOALS - Next 12 months Activities	Measurement Expected	Actual	Savings Expected	Actual	Investment	Assigned to	Funding Source
Replace all the large single speed pumps with variable speed pumps with integrated computer monitoring at 3 aquariums	KWh & btu		TBD		$1.5 million	NC Aquariums	Capital investment when funds available
Develop funding for lighting upgrade for Education Center	$, kwh		40%		$95,000	Zoo	R&R when available
Develop funding to conserve energy at the Desert Pavilion	$, kwh		TBD		$318,000	Zoo	R&R when available
Develop funding to replace the boiler at Museum of Natural Sciences Research Lab	$, kwh		TBD		$35,000	Museum of Natural Sciences	R&R when available

Water Management

Strategy

a. Prioritize water conservation activities as low, no-cost or capital, and identify /leverage potential funding sources and incentive programs.
b. Utilize replacement strategy that considers life cycle cost analysis, simple payback, and increased efficiency.

Tactics

ACCOMPLISHMENTS - Past 12 months Activities	Measurement Expected	Actual	Savings Expected	Actual	Investment	Assigned to	Funding Source
Haw River State Park/Youth and Admin. Building-Replace (8) urinals with waterless type.	Kwh,		156,000 Gallons Per year		$5,000	Parks and Recreation	PARTF
Restroom fixtures replacement	Gallons/$	572,880	TBD	$7,720	$13,950	Marine Fisheries	other
Install gray water reuse system at Pine Knoll Shores aquarium	Gallons/$		TBD		TBD	Aquariums	R&R
Repair pool leaks in Rocky Coast as part of Polar Bear construction	Gallons/$	1 mgal	$8,000	$8,000	$100,000	Zoo	R&R

GOALS - Next 12 months Activities	Measurement Expected	Actual	Savings Expected	Actual	Investment	Assigned to	Funding Source
Kerr Lake (Satterwhite Point) Install (8) waterless urinals, (6) low flow toilets, (1) on-demand water heater.	Gallons, Kwh				$9,100.00	Parks and Recreation	PARTF
Install low flow toilets in E/R Restrooms	Gallons/$	Project to bid 9/2012	TBD		TBD	Zoo	SZF
Install gray water reuse system at Fort Fisher and Roanoke Island aquariums.	Gallons/$		TBD		TBD	Aquariums	As funds become available

Awareness and Training

Strategy

a. DENR's Sustainability Team has been designated as DENR's Conservation Action Team (CAT), and is made up of members from all Divisions.
b. Inspire a culture of sustainability within DENR by promoting environmentally responsible actions.
c. Educate staff that energy conservation reduces operating expenses, thus providing more funds for programs that support DENR's mission.

Tactics

ACCOMPLISHMENTS - Past 12 months Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Investment	Assigned to	Funding Source
Continued to educate DENR employees about Green Living/Green Square Complex policies.	ongoing		TBD		NA	CAT	salary
Collaborated with NC Project Green to implement online conservation education module for all DENR staff.	# staff who participate		TBD		NA	NC Project Green/CAT	DENR
Distributed follow-up facility survey to determine whether administrative impediments to energy and water savings initiatives have been removed.	TBD		TBD		NA	CAT	salary
DENR Sustainability Awards for Individual and Group Projects.	annual		Annual 17 award nominations 2011		$100 Due to donated awards	CAT	DENR
Facilitate the waste free movement of DENR offices to Green Square and Archdale.	ongoing		NA		$2,200	CAT	DENR
Collaborated with DENR IT to provide online conferencing to reduce travel.	ongoing		TBD		$600	CAT	DENR
GreenerDENR newsletter distributed by email to employees.	monthly	monthly	NA		NA	CAT	salary

Awareness and Training (cont.)

ACCOMPLISHMENTS - Past 12 months Activities	Measurement Expected	Measurement Actual	Savings Expected	Savings Actual	Investment	Assigned to	Funding Source
Best Work Place for Commuters - developed carpool, vanpool, park and ride registry.	ongoing		NA		NA	CAT	salary
Continued to provide transit information to DENR employees.	ongoing		NA		NA	CAT	salary
GOALS – Next 12 months Activities	**Measurement Expected**	**Measurement Actual**	**Savings Expected**	**Savings Actual**	**Investment**	**Assigned to**	**Funding Source**
Continue to educate DENR employees about Green Living/Green Square Complex policies.	ongoing		TBD		NA	CAT	salary
Collaborate with NC Project Green to implement use of online conservation education module for all DENR staff.	TBD		TBD		NA	NC Project Green/CAT	DENR
Distribute follow-up facility survey to determine whether administrative impediments to energy and water savings initiatives have been removed.	TBD		TBD		NA	CAT	salary
DENR Sustainability Awards for Individual and Group Projects.	annual		NA		$25	CAT	DENR
Collaborate with DENR IT to provide online conferencing to reduce travel.	ongoing		TBD		TBD	CAT	DENR
GreenerDENR newsletter distribution by email to employees.	monthly		NA		NA	CAT	salary
Best Work Place for Commuters - develop carpool, vanpool, park and ride registry.	ongoing		NA		NA	CAT	salary
Continue to provide transit information to DENR employees.	ongoing		NA		NA	CAT	salary
Continue to facilitate the waste free movement of DENR offices to Green Square and Archdale.	ongoing		NA		$1,000	CAT	DENR

DECLARATION OF SUPPORT FOR DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES STRATEGIC ENERGY PLAN

I have read the strategic Energy & Water Plan for my Organization. The plan as presented supports the reductions required in G.S. 143-64.12(a).

Implemented this 5th day of October, 2012

Department Secretary

Department Deputy Secretary

Budget Director

Controller