

# Colorado Department of Transportation

## Report on the Integration of CDOT

# Greening Activities



"Today's problems cannot be solved by  
thinking  
the way we thought when we created them."  
Albert Einstein

**DRAFT**

July, 2009

# **COLORADO DEPARTMENT OF TRANSPORTATION'S**

## **Greening Activities**

### **Introduction**

The Colorado Department of Transportation's (CDOT) has been engaged in numerous "greening" activities over the past decade. In the current lexicon, "greening" refers to environmental responsible actions such as more efficient use of energy and water, recycling and reuse of materials, etc. Many of these activities were initiated by CDOT in response to market trends or just good business practices. This report is a documentation of these CDOT greening activities already underway and potential future commitments in response to the Governor's directives and its own initiatives. This Report outlines the current steps and practices that will continue to guide the efficient use and intelligent investment of resources to ensure healthy outcomes and sustained prosperity for the department and the State of Colorado.

### **What are the CDOT greening activities?**

The CDOT greening activities include a set of department-wide activities that addresses many facets of its operations. It combines the individual efforts of its employees around the state at some 250 locations and centralized programs at headquarters. The activities identified reduce and recycle materials; either conserve or more efficiently use water and energy, promote the use of green products and renewable energy, and reduce harmful air emissions. This report also identifies potential future activities that it desires or plans to expand.

### **Why is CDOT engaged in greening activities?**

CDOT is one of Colorado's largest users of energy, water and construction materials. It uses annually 1.2 million gallons of diesel fuel, 50-60 million gallons of water, 445,000 tons of concrete, and over 2 million tons of asphalt. It generates almost 60,000 tons of CO<sub>2</sub> annually. CDOT has enormous opportunities for greening its activities and being a model for other state agencies.

Over the past several years, CDOT has strengthened and formalized its environmental programs and adopted an environmental ethic for the department:

*The Colorado Department of Transportation will support and enhance efforts to protect the environment and quality of life for all of Colorado's citizens in the pursuit of providing the best transportation systems and services possible.*

In addition, CDOT prepared an *Environmental Stewardship Guide* that describes its specific environmental responsibilities within the Department as well as the consultative

processes to be used to improve the environmental approval and project development process. Many of these responsibilities are considered greening in the present context.

In addition, on April 16, 2007 Governor Bill Ritter issued two "Greening of State Government" executive orders (one order sets [goals and objectives](#) , and the other serves as the [implementing document](#)). The orders establish several goals for the reduction of energy consumption in state facilities and vehicles, and for the use of efficient materials and resources, by 2012.

The Greening Government goals Colorado state government seeks to achieve by June 30, 2012 are:

- 20% reduction in energy use
- 20% reduction in paper use
- 10% reduction in water consumption
- 25% volumetric reduction in state vehicle petroleum consumption

Each state department is directed to create a sustainability management system to track their progress. The pursuit of an integrated greening program for CDOT is one step in accomplishing the Governor's directives.

### **How was the CDOT integrated greening program developed?**

The CDOT Greening Council is an internal team of employees representing a cross-section of interests and disciplines from both headquarters and the region. The following members of this Council contributed to the identification and presentation of greening activities in the department:

- |                            |                   |
|----------------------------|-------------------|
| ▪ Bob Authobee             | ▪ Tracey McDonald |
| ▪ Brad Beckham             | ▪ Joe Mahoney     |
| ▪ Ralph Bell               | ▪ Pat Martinek    |
| ▪ Marcella Broussard       | ▪ Scott McDaniel  |
| ▪ Sarah Czajka             | ▪ Thom Rivera     |
| ▪ Jennifer Finch, Co-chair | ▪ Mike Salaman    |
| ▪ Rick Gabel, Co-chair     | ▪ Mike Strimbu    |
| ▪ Randy Jensen             | ▪ Dave Wieder     |
| ▪ Sandi Kohrs              | ▪ Cheryl Wright   |

### **Green Council Goals, Objectives and Process**

The Green Council was convened by co-chairs Jennifer Finch and Rick Gabel. Under their guidance, the council membership was expanded to include regional representatives and perspective. The purpose(s): provide oversight and guidance to the various program development efforts. Document existing efforts, propose steps to integrate efforts, and make recommendations for CDOT Greening Program.

The Council met six times to review the various greening activities of the department by hearing presentations from the council members and discussing how these activities could be integrated into a cohesive program. These discussions also provided the opportunity to identify those activities that were common to many departmental areas and those that were unique to specific divisions. In addition to presentations from council members, the Council had two guest speakers – Angie Fyfe from the Governor’s Energy Office and Joni Teter from U.S. EPA – both who made presentations and answered questions regarding green initiatives on the state and federal level.

### **CDOT Greening Studies and Initiatives**

CDOT has recently undertaken a number of studies and initiatives to explore greening opportunities for the department. These efforts have created a foundation for several of the elements of an integrated approach. Below is a short summary of those undertakings.

- *Greening Government Research and Implementation Project – Phase I*

This research project was designed to identify how CDOT could achieve the goals and objectives mandated in the Governor’s executive orders on greening state government. The report recommends preliminary actions to begin greening at CDOT including the formation of a Greening Council and additional research that could be undertaken. This study was limited to Property Management and six CDOT divisions in headquarters. (December, 2007) (See Appendix A for an Executive Summary)

- *Green Maintenance Pilot Project*

The Green Maintenance Program (GMP) was developed as a pilot program in two CDOT regions to foster environmental compliance and promote the development of a culture and commitment to actively utilize environmental Best Management Practices (BMPs) and pollution prevention techniques. This pilot program was designed to help maintenance facilities run a cleaner, more efficient shop, minimize human health risk and environmental impacts and save money. The GMP also documented effective environmental activities already being conducted by maintenance teams. The pilot program designed an awards program to recognize and reward environmental sound practices in the maintenance area. (August, 2008) (See Appendix B for the green maintenance checklist and inventory forms developed)

- *Materials Recycling and Reuse – Finding Opportunities in Colorado Highways*

This study was to determine a strategy to improve recycling on highway projects and reduce waste in landfills. The project focused primarily on five high-tonnage materials: asphalt, concrete, metal, wood, and tires. These materials can be reused, recycled, and replaced on highway projects in cost-effective ways. It also included recommendations for implementation. (October, 2007) (See Appendix

C for an Executive Summary)

- *Air Quality Programmatic Strategies*

This study was a cost-effectiveness analysis of selected air quality programmatic strategies to reduce air emissions including greenhouse gases in lieu of project-level air quality mitigation measures that are impractical on a project-by-project basis. The study included recommendations and implementation steps. It has now been proposed as a Programmatic directive. (October, 2008) (See Appendix D for Summary)

- *Increased Use of Fly Ash in Concrete Mixtures*

CDOT has been studying the use of additives to concrete as a substitute for cement that is energy-intensive to produce. The production of cement is reportedly responsible for 5% of the global greenhouse gas emissions created by human activity.<sup>1</sup> Fly ash is one of the residues generated in the combustion of coal and is considered a waste material. However, ash used as a cement replacement must meet strict construction standards, although no standard environmental guidelines have been established in the United States.

CDOT amended its Standard Specifications for Road and Bridge Construction in 2002 to allow for the addition of up to 20% Class C fly ash and up to 30% Class F fly ash in concrete. A new effort has just been launched to investigate optimizing concrete mix design by further reducing the cementitious material in concrete by the addition of more aggregate while maintaining the same durability.

- *Energy Performance Audits*

CDOT is in the final stages of initiating an Energy Performance Contract with a qualified Energy Service Company (ESCO).

An Energy Performance Contract (EPC) is a turnkey service, sometimes compared to design/build construction contracting which provides customers with a comprehensive set of energy efficiency, renewable energy and distributed generation measures and often is accompanied with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project.

The value of an EPC has been recognized and all Colorado State Agencies have been provided direction through:

- Executive Order D 014 03 Governor Owens (7/16/03): Requires all State agencies to initiate energy performance contracts where opportunity exists to better utilize budgets. And,

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<sup>1</sup> Battelle, "Climate Change," Toward a Sustainable Cement Industry, World Business Council on Sustainable Development, 2002.

- Executive Order D 0012 07 (4/16/07) Governor Ritter, Greening of Government: Reiterates the use of energy performance contracting from EO 014 03; if performance contracting is not feasible, state agencies must reduce energy consumption by 10% from the Fiscal Year 2005-06 baseline.

A typical EPC project is delivered by an ESCO and consists of the following elements:

- **Turnkey Service** – The ESCO provides all of the services required to design and implement a comprehensive project at the customer facility, from the initial energy audit through long-term Monitoring and Verification (M&V) of project savings.
- **Comprehensive Measures** – The ESCO tailors a comprehensive set of measures to fit the needs of a particular facility, and can include energy efficiency, renewables, distributed generation, water conservation and sustainable materials and operations.
- **Project financing** – The ESCO arranges for long-term project financing that is provided by a third-party financing company. Financing is typically in the form of an operating lease or municipal lease.
- **Project Savings Guarantee** – The ESCO provides a guarantee that the savings produced by the project will be sufficient to cover the cost of project financing for the life of the project.

The scope of CDOT's EPC spans all Regions and will potentially impact all CDOT facilities that use energy. The EPC timeline states that an ESCO shall be selected and the initial energy audit will be completed by July 2009.

### **Greening Program Elements**

The Greening Program was developed around six program elements: material usage, energy conservation, water conservation, green products, renewable energy, and air emissions. These six general program elements were selected because they correspond to the greening activities conducted within CDOT and to the areas designated in the Governor's directives. They are also general enough to capture a wide variety of activities e.g. material usage includes recycling, reuse and reduction strategies for all types of materials.

### **Greening Program Common Elements**

Since there are many elements of the CDOT Green Program that are common to the various divisions and programs at CDOT, the Greening Council selected several areas that were common to many but not all divisions. Those areas most often found were in the office environment where voluntary measures were initiated by staff to recycle material or save energy. For example, many offices have instituted paper and aluminum can recycling. The most common activities conducted by many CDOT offices include the

following:

- Office Materials Usage
  - Paper recycling (including cardboard)
  - Use of double-sided printer
  - Aluminum can recycling
  - Ink cartridge and toner recycling
  - Recycle plastic materials
  - Recycle small batteries
- Office Energy Conservation
  - Use of Energy Star equipment
  - Use of efficient or compact fluorescent lighting
  - Use of photocell indoor lighting
  - Unplug devices not in use (computers, printers, etc.)
- Office Water conservation
  - Use of non-water urinals
  - Use of low-flow or dual flush toilets
  - Automatic on-off faucets
- Green Products
  - Purchase of recycled paper for all network printers

### **Region 6 Experience<sup>2</sup>**

Regions 6 initiated a single-stream recycling program with a goal to become the most “green” region in the state. Sarah Czajka who spearheaded the effort noted that “This recycling program is an easy way for us to get started.” Region 6 is working with Waste Management of Colorado to pick up the collected recyclables from South Holly. Single Stream Recycling means that rather than having one recycle bin for paper, one for plastic, one for aluminum and one for glass, you can put *all* of these recyclables into one receptacle. All food items need to be rinsed before putting them in the recycling bin, i.e., plastic lunch trays, pop cans and bottles, yogurt containers, soup cans, plastic cups – anything that had food or other liquids in it. After rinsing and discarding of your waste properly, you will be left with virtually nothing but garbage in your “regular” trash can. Facilities personnel will be focusing more on dumping the recycle bins for daily trash removal. The garbage cans will be dumped as needed.

Rob Haines and his crew have been proactive in recycling and energy conservation for at least 6 years. In an effort to save money the maintenance section recycles all oil from vehicles, using free services from the recycling vendor; returns used batteries to the vendor for credit; and sends all tires that still have good casings to a vendor for re-capping (re-treads) which ends up saving on the cost of new tires for the equipment. The re-caps last just as long as new tires and cost less.



*Rob Haines, Sarah Czajka and Randy Jensen, shown here at the ice cream social, are leading the GMP in Region 6.*

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<sup>2</sup> This material is excerpted from an article written by Jill Brogdon in the Region 6 *En Route* Newsletter.

The biggest savings in the maintenance section comes from the recycling of steel scrap. Since July of this year, Region 6 has recycled \$42,000 worth of steel from damaged guard rails, scrap from roadside collections and various other clean-up projects. The money received goes directly back into the general fund. In addition to these money saving efforts, the maintenance crew has made improvements to the different buildings for the Region. For instance, there are now programmable thermostats, double pane windows and new insulation in most of the sheds and office buildings. Looking ahead, Region 6 would like to convert to solar and wind power for electrical generation.

### **Region 4 Experience**

In March 2008, CDOT Region 4's Quality Work Life Team (QWLT) made a presentation to the region's managers seeking their blessing to establish a recycling program in the Greeley office. QWLT sought to develop a program stressing the benefits of recycling for all employees. The managers agreed with the project's goals, but of because of budget shortfalls, requested that QWLT institute this program with a minimum of overhead.



Region 4 is the beneficiary of a program between the Shriners and Waste Management where the Shriners collect the Greeley office's recyclables at no cost. QWLT spent much of 2008 planning how to best implement and notify staff of this new recycling program. The single-stream program accepts aluminum, tin cans, glass bottles, office paper, cardboard, and plastics. The only outlay was \$50 for nine recycling bins placed throughout the complex. Employees volunteer to collect and drop-off the recyclables at a central dumpster for the weekly pick-up. Looking toward the immediate future, QWLT would like to expand its recycling efforts across Northern Colorado to the region's four residencies.

## **Present Greening Activities**

The following describes the greening activities now in practice at CDOT. Since the previous section covered those activities that were common to most all divisions, the following sections outline greening activities that are unique to the designated functional areas.

### **Material Usage (Recycling, Reuse and Reduce)**

- Design and Planning
  - Use of material with recycled content
  - Use of material with greater durability to reduce repair/replacement
- Facilities Management (Headquarters)
  - Utilizes recycled cubicle walls when furnishing buildings reducing the demand on virgin materials and keeps them entering landfills.
  - Arranged for the removal of old computer monitors with Hewlett Packard when new monitor were purchased avoiding the disposal of universal waste
- Fleet Vehicles
  - Burning used oil in space heaters to reduce waste
  - Utilizing Jiffy recycled engine oil
  - Recapping tires for reuse
  - Recycle used oil filters
- Information Technology
  - Recycles all cell phones from within IT and accepts from other divisions
- Print Shop
  - Utilizes vendor to launder rags
  - Recycles metal plates used for printing
  - Eliminated hazardous chemicals associated with printing
  - Single-stream recycling in place
  - Shop prints on a million-and-half sheets of recycled paper each month
- Property Management and Facilities
  - Utilize low Volatile Organic Compound (VOC) carpet squares which can be replaced in high-wear areas
- Construction Activities (Transportation System)
  - Increased Recycled Asphalt Pavement (RAP) to 20% for all lifts of Hot Mix Asphalt (HMA).
  - Reuse of 100% of existing roadway

- 100% of Millings from CDOT projects used either by the Contractor or by CDOT Maintenance
  - Crushed Concrete, millings, routinely used as aggregate based concrete
  - Use rubberized concrete for structural road base
  - CDOT chemically stabilizes existing weak soils in-place rather than excavating and replacing with borrow materials
  - CDOT uses fly ash, a byproduct of coal fired power plants, in concrete mix and soil stabilization
  - RAP/Millings used for shouldering and road base rather than virgin quarried material.
  - RAP/Millings incorporated in HMA mix up to 15% to reduce amount of asphalt cement needed.
  - Scrap paper / plan sheets reused for note pads and scratch paper.
  - Cold and Hot In-place Recycle and Full Depth Reclamation reuse for 100% of existing roadways.
- Maintenance Activities (Transportation Infrastructure)
    - Recycle oil and oil filters through vendor
    - Reuse oil as fuel
    - Recycle anti-freeze
    - Recycle vehicle batteries
    - Reuse/recycle asphalt and concrete
    - Reuse and recycle metal through vendor
    - Reuse guardrails (after straightening with machine)
    - Use recycled tire chips in asphalt
    - Reuse chip trimmings for mulch

## **Energy Conservation**

- Design and Planning
  - Implementing “Safe Routes to School” program and “Congestion Mitigation/Air Quality” activities designed to reduce petroleum use by encouraging alternative forms of less-polluting transportation.
  - Promoting bicycle/pedestrian friendly designs in workshops
  - Providing commuter checks to employees who bicycle, walk and take public transportation to work and meetings.
  - Promote “Bike to Work Month” and provide bike sheds for employees.
  - Improve traffic flow (HOT/HOV lanes, use of innovative designs e.g. roundabouts, queue jumping, access point consolidation, etc.)
  - VMT reduction research studies
- Facilities Management (Headquarters)
  - Implemented an energy management system so computers can control room temperatures to reduce energy consumptions.
  - Installed a flat plate mechanical system to reduce energy consumption.
  - Upgraded lighting at headquarters with Energy Star fixtures.
  - Re-roofing with a new energy efficient membrane

- Fleet Vehicles
  - Region 5 running bio-diesel in their equipment to replace petroleum
  - Use of hybrid vehicles
  
- Information Technology
  - Recommends monitors be set to sleep mode after 30 minutes
  - Provides remote email access through VPN to work from home and installed software for rerouting calls for handling Help Desk remotely
  - Migrating to Blade Server Technology which conserves energy and emits a small carbon footprint
  - Implementation of videoconferencing to reduce commuter travel.
  
- Property Management and Facilities
  - Energy Star light and heating fixtures included in bid specifications and energy efficient insulation for design build
  - Installation of thermostat devices with limited variance temperature from master thermostats set up in zones
  - Instructed contractors to always turn-off lights after leaving the buildings.
  - Installed infrared heating tube system within maintenance building
  - Replaced some garage doors with energy efficient windows in some maintenance buildings
  - Install motion sensor lighting with auto shut-off on all new sand shed buildings and bathrooms
  - All buildings constructed comply with 2006 International Energy Conservation Code
  
- Construction Activities (Transportation System)
  - Warm Mix Asphalt requires less energy to produce and can be placed during lower temperatures at night, reducing traffic backups
  - Encourage construction staff to turn off vehicles when leaving it unattended for more than 1 minute (commonly left running while stepping out to inspect something in the field) - reduces emissions and fuel consumption
  - Replace conventional overhead light fixtures with Light-emitting diode (LED) or other low energy technology light element.
  - Use LED monitors that use less energy and reduce eye strain
  
- Maintenance Activities (Transportation Infrastructure)
  - Use doubled-paned windows and automatic door openers
  - Use photocells on outside lighting
  - Minimize idling of vehicles/equipment not in use
  - Carpooling or use of combined trips
  - Reduce attendance at out of town meetings to reduce travel
  - Revised policy to reduce VMT
  - Use of well insulated facilities and piping
  - Use of natural light whenever possible
  - Use of passive heating for buildings

- Unplug appliances to decrease “phantom” energy draws or shut off
- Report and monitor electric, heating, and water bills
- Work with utility providers to take advantage of demand size management opportunities for cost savings,
- Implement training programs for staff and building occupants
- Develop an agency energy management plan in conjunction with the five year building plan
- Verify and ensure that fundamental building elements and systems are installed, calibrated, and operating as efficiently as possible
- Develop guidelines that help to educate and guide employees on efficient utility usage
- Install automatic openers on all regularly utilized garage doors so doors may be closed as soon as possible. Operators are to close doors immediately upon entering or exiting the building.
- Electric infrared or other energy efficient heaters may be installed to replace older inefficient units. Heaters that operate on used motor oil should be installed where CDOT has enough used oil to run the units.
- Provide electrical service at all sand pile locations so that loaders can be plugged in. This will enable the loaders to be left outside at the sand piles and still start in cold temperatures.
- Thermostats in all Maintenance Sheds are to be set at no higher than 60 degrees (55 is preferable when the building is unoccupied). As budget allows all buildings will have automated preset thermostats installed. The only time higher temperatures will be allowed is to melt snow and ice off of equipment.
- Building equipment doors are to be closed immediately once a piece of equipment has exited or entered a building
- An air compressor shall be used to charge the air supply of equipments quickly, so the unit does not have to wait to build air while the door is open.
- Shop doors where loaders are stored are not to be left open while loading a truck. This includes truck loading during snow events.
- Water pipes that have a history of freezing will be insulated or electrically heated. Building heating systems will not be used to keep pipes thawed.
- Turn lights off in shops, offices, and bathrooms if not being used.
- Lights on Sand Sheds shall be placed on motion sensors
- Alternate heat sources such as electric heaters under desks and air conditioning units will be turned off when the building is not occupied.
- Weather stripping on bay doors shall be replaced and kept in good repair
- Do not leave water running if not directly being used to wash equipment or floors. Install a nozzle on water hoses so they only run water on demand.

## **Water Conservation**

- Design and Planning
  - Adoption of stormwater BMPs
- Facilities Management (Headquarters)

- Upgraded the irrigation system to run off of well water and wireless zones on timers
- Trained employees to turn-off sprinklers on days when rain is forecast
- Fleet Vehicles
  - Use of recycled water for power washing of vehicles and equipment
- Construction Activities (Transportation System)
  - Use of wetting agents such as magnesium chloride reduces the amount of water needed for dust control and reduces added water requirements for moisture/density compaction.
  - Use of waterless sanitary facilities at the construction site.
- Maintenance Activities (Transportation Infrastructure)
  - Use of high-pressure, low-volume water nozzles for washing
  - Xeriscaping used at facilities
  - Water-saving devices used in landscaping watering
  - Reuse of gray water for dust suppressant and to fill street sweepers
  - Mulch landscaped areas to retain water
  - Use of drought resistant seed mix

## **Renewable Energy**

- Planning and Design
  - Solar panels rest stop research
- Construction Activities (Transportation System)
  - Solar powered LED beacons such as proposed on switchbacks on Berthoud Pass will save energy and construction costs for trenching in miles of conduit.
- Transportation System Maintenance Activities
  - Use of passive solar heating in buildings

## **Air Emissions**

- Planning and Design
  - Air quality programmatic approach to CO<sub>2</sub> and NO<sub>x</sub> emissions
  - Designing to encourage alternatives to the single occupancy vehicle and trip reductions
  - Encouraging eco-pass, bike use, walk to work/school programs
  - VMT reduction research
  - Improvements to traffic flow
- Print Shop
  - Shop boilers run on natural gas
- Construction Activities (Transportation System)

- Green Concrete - less CO2 emissions when it's placed.
- Use of HMA that produces far less CO2 than Portland concrete cement (PCC)
- LED beacons/arrow sticks on vehicles can be operated without the vehicle running.
- Green fleet replacement options.
- Require low sulfur diesel fuel for construction equipment
- Maintenance Activities (Transportation Infrastructure)
  - Minimize idling of vehicles when not in use
  - Carpooling or use of combined trips to minimize vehicle use
  - Reduce attendance at out of town meetings
  - Activity scheduling to avoid traffic
  - Revised policy to reduce VMT

## **Green Products**

- Facilities Management (Headquarters)
  - Cleaning staff utilizes only green products
- Fleet Vehicles
  - Installed aqueous cleaners to replace solvent-based cleaners
- Purchasing and Procurement
  - Agreement with office suppliers for discount on purchase of green products
  - Inclusion in Property Management bid specifications Energy Star light and heating fixtures and energy efficient insulation.
  - Participation in office supply consortium to influence environmentally preferable purchasing.
- Print Shop
  - Uses water-soluble inks and solvents
- Property Management and Facilities
  - Revise insulation specifications to eliminate the requirement for vinyl-faced products
  - Specify recycled rubber flooring or natural linoleum in lieu of Vinyl Composition Tile (VCT).
  - Specify ceramic tile with recycled content in lieu of current ceramic products.
  - Specify rubber base (mop base) with recycled content.
- Maintenance Activities (Transportation Infrastructure)
  - Use lead-free and latex paint
  - Use biodegradable degreasers and solvents
  - Use biodiesel fuel/E-85
  - Use low mercury content CFLs

## **Sustainability**

- Design and Planning
  - Promote and use Context sensitive design/solutions
  - Protect, enhance and restore wildlife habitat (including the reduction of animal/vehicle collisions)
  - Research and development on sustainable practices
  - Avoid & minimize through environmentally sensitive design

## **Future Greening Activities**

In addition to these existing sustainability or greening practices, CDOT has identified many future actions that will be given consideration. Those are the following:

### **Material Usage**

- Specify in bids the use of green products, materials, etc. (research the potential of increasing fly ash in concrete; utilization of crumb rubber tires and recycled asphalt shingles in asphalt mixes)
- Use of low VOC emitting plantings
- Increase recycling, use of green products and reuse of materials.
- Specify recycling of demolished steel building
- Consider a project reusing unused aluminum roadway signs as shingled siding.
- Research ongoing to increase % of RAP used.
- CDOT is testing new methods to allow use of recycling treatments in heavier traffic and deeper rehab sections
- CDOT should develop guidelines for use of cold or hot recycling methods followed only by thin wearing surface
- CDOT is investigating waste shingles as HMA additive
- CDOT is researching tire crumb rubber for soil stabilization
- Brasier Mix is being evaluated on low volume roadways - 100% millings mixed with emulsion and laid
- Brasier Mix could be used as bond breaker prior to PCC Pavement
- RAP Chip Seals are being evaluated by CDOT
- Improved Preventive Maintenance techniques have been evaluated and timely PM application should be increased
- Mixed stream recycling should be conducted at all office locations
- Recycle bins for residencies and job trailers.
- Continue research of newer technologies
- Recycle rechargeable batteries
- Recycle tires found on roadways
- Compost at facilities
- Recycle solvent parts cleaner through vendor
- Use biodegradable microbe technology for petroleum cleanup
- Use sustainable or recycle content in construction/building materials

## **Energy Conservation**

- Purchase of more hybrid vehicles
- Explore with FHWA on what can be included in specs to help meet EO requirements.
- Work with MPOs to give incentives for energy efficient projects.
- Encourage development of TMAs and provide technical assistance.
- Instituting a program of Energy Performance Contracting to improve energy performance.
- Pilot project to shut-off all PC on night and weekends
- Evaluating multi-functional printers
- Occupancy sensors in Vehicle Storage Facility (VSF) restrooms on 10 minute delay
- Adding additional light zones in VSF to cut electric usage
- Revise Infrared heating layout to reduce number of inline fans
- Use tankless water heaters in lieu of 30 gal. tanks
- Install insulated clerestory lights (windows high on the wall to provide natural illumination) along the north wall of new VSFs.
- In cold climate areas with southern exposed end walls, consider incorporation of a transpired solar collector to offset heating requirements, could provide a dual purpose for the intake ventilation fan. Such a system could be used to provide all the heating needs for the office areas.
- Use of radiant heat in-floor
- Use of flash hot water system
- Gravity-fed water system in lieu of pump
- Use of photocells on inside room lighting
- Daylight-responsive lighting controls
- Occupancy sensors
- Under-floor air distribution
  
- **Water Conservation**
- Design of features that use permeable soils to remove surface pollutants, bio-retention, grass buffers, swales, sand filters, xeriscape, low-use/efficient water irrigation systems, shading, natural vegetation for minimal mowing and weed control.
- Installed non-water urinals
- Recycled water used for irrigation

## **Green Products**

- Preferential treatment of contractors that implement greening practices within design and with adopted practiced EMSs.
- Coordination with FHWA on incentives in bid packages.

## **Renewable Energy**

- Use of solar street lights, signals, warning lights, passive solar design
- Leasing of rooftop and ROW space for wind turbines and photovoltaic panels
  - Composting of landscaping and food wastes.

- Buying Windsource.
- Install grid-tied solar panels on south facing roofs where metering is available
- Consider life-cycle implications and potential for going off-grid in rural locations
- In locations with existing storage tanks and south facing roofs, install solar hot water systems.
- Investigate wind generation technology.
- Use of geothermal resource

### **Air Emissions**

- Truck parking electrification
- Reduce emissions through pavement design
- Require use of sustainable materials in lieu of high-emission producing material e.g. cement.
- Promote use of alternative fuels.
- Challenge local governments to assesses the land-use/transportation relationship as part of local and regional planning decision making
- De-icing sand reduction
- Revise mowing schedule during summer

### **Sustainability**

- Coordination between land use and transportation planning
- Alignment selection
- Integration of land use and transportation planning
- Protect, plan and mitigate for tree and plant removal
- Incorporate sustainability in long range planning.

### **Response to Governor's Executive Orders**

The Governor's Executive Orders focused on four areas: Energy Use, Paper Use, Water Conservation and State Vehicle Petroleum Consumption. The CDOT Greening Program responds to the Governor's directives as follows:

**Governor's Goals**

- 20% reduction in energy use
- 20% reduction in paper use
- 10% reduction in water consumption
- 25% volumetric reduction in state vehicle petroleum consumption

#### **Energy Use**

The goal for reduction in energy use is 20% by June 30, 2012. CDOT's reductions will come in two areas: Electricity usage and natural gas usage. A large reduction is expected from building heating usage.

CDOT is in the final stages of initiating an Energy Performance Contract with a qualified Energy Service Company (ESCO). An Energy Performance Contract (EPC) is a turnkey service, sometimes compared to design/build construction contracting which provides customers with a comprehensive set of energy efficiency, renewable energy and distributed generation measures and often is accompanied with guarantees

that the savings produced by a project will be sufficient to finance the full cost of the project.

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A typical EPC project is delivered by an ESCO and consists of the following elements:

- **Turnkey Service** – The ESCO provides all of the services required to design and implement a comprehensive project at the customer facility, from the initial energy audit through long-term Monitoring and Verification (M&V) of project savings.
- **Comprehensive Measures** – The ESCO tailors a comprehensive set of measures to fit the needs of a particular facility, and can include energy efficiency, renewables, distributed generation, water conservation and sustainable materials and operations.
- **Project financing** – The ESCO arranges for long-term project financing that is provided by a third-party financing company. Financing is typically in the form of an operating lease or municipal lease.
- **Project Savings Guarantee** – The ESCO provides a guarantee that the savings produced by the project will be sufficient to cover the cost of project financing for the life of the project.

The scope of CDOT's EPC spans all Regions and will potentially impact all CDOT facilities that use energy. The EPC timeline states that an ESCO shall be selected and the initial energy audit will be completed by July 2009.

### **Paper Use**

No formal policy or strategic action has been taken at this time.

### **Water Conservation**

No formal policy or strategic action has been taken at this time.

## **State Vehicle Petroleum Consumption**

CDOT has adopted a Fuel Reduction Plan. That Plan proposes making changes to existing CDOT policies to achieve the 25% reductions required.

Internally at CDOT, direction on equipment usage exists in CDOT Procedural Directives 9.1 and 9.2. These directives address commuting with State owned vehicles (9.1) and Utilization and Replacement of Road Equipment (9.2). There is currently no policy directive on the management of equipment from a fuel efficiency perspective.

An Equipment Management Policy Directive (PD 9.0) will be created establishing the policy of CDOT on these matters. The scope of CDOT's PD 9.1 will be increased to include guidance on Carpooling, Commuting, Attendance at Meetings and Use of Motor Pool Vehicles. PD 9.2 will be revised as described below.

Additional direction on equipment provided by State Fleet Management (SFM) is provided in the SFM rules and procedures and in the aforementioned Governor's Executive Order.

### ***Low Use***

Low use is addressed in CDOT's PD 9.2 for CDOT owned equipment (over  $\frac{3}{4}$  ton). The directive provides planned annual usage for each unit in CDOT's possession. It also provides guidance for the minimum amount of usage each unit should receive to avoid designation as "low use". For most maintenance equipment, anything less than 100% of planned annual use is deemed to be low use. Low use equipment has to be justified or turned in for sale or reassignment. This criterion may be contributing to excess miles being driven to avoid the loss or reassignment of a vehicle that might be "under utilized".

CDOT intends to rewrite this guidance to develop equipment allocation and assignment criteria based upon the maintenance and construction needs for this equipment as opposed to continuing somewhat punitive measures should equipment be "under utilized". The language of the directive will be strengthened to instruct operators and managers to ensure the level of usage is efficient for the tasks that must be undertaken and to avoid driving unnecessary miles just to avoid the low use designation.

For SFM owned vehicles (cars and other vehicles  $\frac{3}{4}$  ton and under), usage is specified by "Vehicle Utilization Codes". For each code (assignment in the agency such as Motor Pool – Regional multi-use, Individual function – Statewide, etc.) there is a minimum annual usage specified. SFM states "*If a vehicle is projected to have less than 100% of its required miles, it may turn up in SFM's annual "Under Utilized" report.*" It also states that "*If under-utilization cannot be satisfactorily explained or justified, assignment of the vehicle may be forfeited. Also, vehicles that are under-utilized in consecutive years may have their assignments revoked.*"

As with CDOT equipment, these requirements appear to encourage use of vehicles to avoid being deemed under utilized which could result in reassignment of the vehicle. CDOT believes that this can encourage more single occupancy use of vehicles than is otherwise necessary to ensure that the required mileage is obtained.

CDOT plans to pursue this matter with SFM to determine if alternative low use and vehicle assignment criteria might be feasible. Such criteria should include allocation and assignment of vehicles based upon the needs of the agency for vehicles and not necessarily on a certain amount of usage. Low use criteria should be reduced to a much lower level.

### ***Replacement of Fleet Units***

For CDOT owned equipment, replacement of fleet vehicles and equipment is driven by the age and use of the units. The higher mileage vehicles compete better than lower mileage vehicles of the same age and the oldest units with the highest mileage being replaced first. This practice may result in more units being utilized when the task requirements do not necessarily require it in order to have equipment that “competes” well for replacement allocation.

CDOT intends to modify its criteria for replacement of vehicles in its maintenance fleet in the short term to allocate funding to the various managers so that they receive their pro rata share of the funds based upon their current fleet replacement values.

As a long term plan, CDOT intends to implement a more industry standard, life cycle cost analysis process for fleet management and replacement. However, this will require time in order to fully develop such a system in CDOT’s computing environment.

SFM allows replacement of units based upon age and mileage of the units. SFM submits lists of units approved for replacement to the agencies annually. The numbers of units replaced depends upon the level of funding authorized for this replacement. Managers who will ultimately receive these replacement units typically specify the type of units to be purchased. CDOT intends to more directly require more energy efficient vehicles for single occupancy vehicles users and in regional motor pools (see *Economy and Fuel Efficiency* section below). Carpooling will be emphasized by requiring that some vehicles be replaced with regional pool type vehicles, thus reducing the numbers of single occupancy or individually assigned to require more effective carpooling for meetings.

CDOT intends to work with SFM to determine whether a life cycle cost analysis replacement as described above would be more effective and efficient.

### ***Economy and Fuel Efficiency***

CDOT intends to explore a policy whereby all unit, section, branch and division managers would be required to meet an *EPA Highway* fuel mileage average of 25 mpg for all SFM assigned vehicles by 2012. Fuel efficiencies for each round of new vehicle replacements will be required to increase that manager's assigned fleet fuel efficiency (average miles per gallon) by not less than 5% per year.

CDOT will restrict the purchase of four-wheel drive sport utility vehicles, except where necessary for emergency response, highway maintenance and construction or use in difficult terrain and where regular travel over high mountain passes during the winter seasons is required.

CDOT will give priority to replacement of pre-1996 light duty vehicles that have a city fuel efficiency rating of less than 25 miles per gallon.

CDOT will be acquiring hybrid gas/electric high efficiency vehicles, alternative and flex-fuel vehicles, and other fuel efficient/low emission vehicles whenever practicable, understanding the increased initial cost for vehicles so equipped.

### ***Commuting***

Criteria exist in PD 9.1 for allowing commuting by maintenance supervisors, certain electrical, electronic, rock fall specialists and project engineers (1 per project and only during projects actively under construction).

The PD allows for Construction personnel not authorized to commute or choosing not to commute to:

- Park the vehicle at the project site (if secured), or
- Park the vehicle at the Resident Engineer's office (if secured), or
- Park the CDOT vehicle at the secured state facility nearest to the project site

CDOT does not anticipate any revisions to this practice. Carrying out its mission requires certain key staff members have State owned vehicles at their residence in order to ensure rapid response to emergencies on CDOT's highways and transportation facilities.

### ***Travel to and attendance at meetings around the State***

While CDOT prefers that meetings be held via remote means, CDOT does conduct a number of meetings around the State as a part of its business. CDOT has already invested in video conferencing infrastructure at key CDOT offices. It also has a remote training/ meeting capability established to allow remote meeting attendees the ability to link to the meeting moderator's computer and enter into a conventional teleconference in order to conduct effective remote meetings.

Carpooling will be encouraged by all meeting attendees to the extent possible. While CDOT does not currently have any directives requiring carpooling, either regionally or via vehicle motor pools, CDOT intends to modify its directives to encourage this wherever possible. Further, these directives will require motor pool managers to recommend car pooling opportunities where multiple individuals have requested single occupancy vehicles for the same meeting.

Managers will be required to reduce meetings for them and their staff in other parts of the state through the effective use of Video Conferencing and Computer Networked/Teleconferenced Remote Meetings.

Managers will determine whether meeting attendance in person requiring travel by attendees is necessary and why the objective of the meeting cannot be met using remote meeting capabilities described above in this section. Managers will also determine whether the meeting itself is truly necessary.

### ***Use and Management of Motor Pool Vehicles***

Use of Motor Pool vehicles will encourage users to use the most fuel efficient vehicle available that meets the needs of the individual. For instance, a four wheel drive vehicle may be appropriate in areas of the state where snowfall is considerable (high country) or during currently occurring snow storms. It may not be necessary for fair weather periods or during the summer months and the more fuel efficient vehicles can be utilized.

### ***Compensation for Use of Personal Vehicles***

The plan requested by OSPB requires “*examining the types of vehicles currently being used (including personal mileage reimbursement versus state motor pool)*”.

CDOT will include compensation guidelines for staff in its rewrite of PD 9.1 to include the following.

Compensation for use of personal vehicle will not occur if there is a more fuel efficient state furnished vehicle available in the regional office or vehicle motor pool. Compensation will be approved for those circumstances where the employee’s personal vehicle is more fuel-efficient than the state furnished vehicle if the employee elects to drive his/her own vehicle.

Meetings that an employee may attend and elect to drive to directly from their residence using their personal vehicle will not be subject to these criteria. Employees will be reimbursed for the use of their vehicle in these circumstances.

Short vehicle trips with a round trip length of less than 20 miles will not be subject to these criteria. Additionally, employees will be encouraged to use transit facilities wherever they may be available.

## **Recommendations Going Forward (For Council discussion)**

The Greening Council made a number of recommendations for going forward to expand the greening activities at CDOT. Below is a list of those recommendations.

1. Initiate a New York Department of Transportation “GreenLites” program pilot approach for CDOT.
2. Adopt the Green Maintenance Pilot Program for all CDOT Regions.
3. Develop a priority list of program initiatives for implementation.
4. Develop performance standards to measure progress in each of the Governor’s Executive Order goals.
5. Develop and implement a Green Construction Program.

In addition, the Council identified the following steps for further developing and implementing a more formal Greening Plan for CDOT.

- **Step 1:** Using the CDOT Environmental Ethic and Governor’s Directives to develop some CDOT Goals for a Greening Program.
- **Step 2:** Utilize the catalogue of CDOT activities, both present and future, and select activities that should be evaluated for part of a CDOT Greening Program.
- **Step 3:** Evaluate the selected activities based on identified criteria by the Green Council e.g. cost, feasibility of implementation, etc.
- **Step 4:** Based on the evaluation, formulate a Greening Program.
- **Step 5:** Identify performance measures to evaluate the success of the Greening Program.
- **Step 6:** Adopt Greening Program elements that will meet the CDOT Greening Program Goals.

