Center for Public Service

Sustainable Municipal Operations

Independence, OR

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Introduction

Over the course of the last four years, as the economic downturn has trickled down to cities and counties, local governments and their administrators have experienced a significant decline in revenues and a tightening of budgets. At this critical juncture for local governments, energy management provides a systematic method for reducing direct costs. However, few cities or counties have the capacity to contribute significant staff time to researching and identifying projects best suited for energy management.

Managing energy as a controlled resource provides the opportunity to local governments to not only conserve funds for other purposes, but it also ensures a more sustainable future. The elements of sustainability and energy management tap into a number of critical operations for local governments, including facilities, public works, human resources and financial management.

Portland State University, Hatfield School of Government (PSU), and Northwest Energy Efficiency Alliance (NEEA), has formed a partnership to develop Sustainable Municipal Operations Plans that documents sustainability and energy management best practices. The goal of this partnership is to determine how a City/municipality can actively manage energy as a controllable expense by following a predetermined operation protocol. The PSU team developed a framework of best practices for sustainable municipal operations in different categories including facilities, fleet, purchasing, operations and the work environment. After identifying pilot jurisdictions, the team applied these best practices to the current operations of local governments in Oregon with limited capacity to do so independently. A list of criteria was used to select the jurisdictions based on the commitment to sustainability and executive level management support. Independence was selected as a pilot for these reasons following detailed conversations with City administrators and management staff on the issues the team would be investigating. The results of this project are intended to both serve as a foundation for each jurisdiction to move forward with implementing improvements, and also as a starting point in learning new and innovative approaches to sustainable operations in municipal and City governments.

The PSU team, compiled of experienced practitioners, worked with Independence initially to provide clarity around the goals and deliverables of the project, solidifying the commitment of the City to provide information and relevant data for the purpose of drafting this report. We visited the City on numerous occasions to understand the current operations, state of facilities, challenges and opportunities for the City and staff.

The following report provides an overview of our process working with Independence to collect and gather information, our findings and recommendations for both the immediate and long term, as well as suggested strategies for implementation.

Defining Sustainability

Sustainability has many definitions. Generally, the accepted definition is, "Meeting the needs of the present without compromising the ability of future generations to meet their own needs". Published in 1987 by the United Nations World Commission on Environment and Development Report, Our Common Future (Bruntland Commission), this definition provides the clearest outline of the task at hand[1].

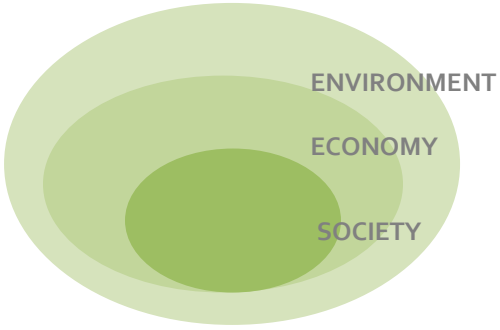
The foundation for sustainability encompasses three core areas, or the Triple Bottom Line: environmental stewardship, economic balance and community enhancement. These provide the base needed to maintain a healthy, livable city.

Cities and counties are playing a significant role in addressing sustainability in a number of ways, from municipal planning policies to how to manage their internal operations. Two key areas of municipal focus have emerged—energy conservation and greenhouse gas emissions (GHG). The main focus of this report is on municipal efforts in energy conservation. GHG is a parallel concern that is addressed in part through energy conservation.

Energy conservation/Sustainability practices identify waste reduction opportunities, ensuring public resource can be applied where best needed, while strengthening the organizations resiliency to inevitable increased costs in energy, and fuel costs. From an economic standpoint it's the fiscally smart thing to do.

Green House Gas and Municipalities

The international scientific community's assessment of human caused impacts on the planet's atmosphere reveals significant concerns regarding increasing annual temperatures and frequencies of extreme weather events. In response to the scientific community's consensus, mayors across the country signed on to the U.S. Mayor's Climate Protection Agreement (MCPA).



In Oregon, the initial response to GHG has been the State setting statewide targets for GHG reductions and in implementing statewide transportation planning requirements in areas such as congestion management. Municipal efforts in energy conservation will be seen as increasingly important in addressing GHG reductions.

Therefore, while Independence's conservation efforts may currently focus on defined internal operations and reducing energy consumption, the overall framework of sustainability should be kept in mind.

Oregon 10 Year Energy Action Plan

The three main goals in the Oregon 10 Year Energy Action Plan will fit well with cities and counties' efforts to improve energy efficiency in their local operations. These goals are to:

- Maximize energy efficiency and conservation to meet 100% of new electricity load growth
- Enhance Clean energy infrastructure by removing finance and regulatory barriers
- Accelerate the market transition to a more efficient, and cleaner transportation system

[1] http://www.un-documents.net/wced-ocf.htm

Section 1: Process

Over the period of eight months, the PSU team worked with Independence to visit facilities, and collect/analyze data with the intent of identifying current areas where the City was already making progress in terms of reducing energy consumption as well as identifying new areas for improvement and enhanced fiscal returns. We met with a broad base of City staff, including facilities and fleet managers, City administrators and staff.

There were three main tools for collecting data and information on the basis of determining set project lists for implementing in the near future. The first method was conducting a department wide survey to better understand and frame current practices in the City relating to sustainability. The second was working with the City to implement a software based program to track energy consumption in buildings. Portfolio Manager, as available through the Environmental Protection Agency (EPA), provides a way to track energy use over time and compare building data to similar buildings across the country. The third was information gathering through meetings and site visits with staff throughout the process on an as needed basis, to assist in setting baseline data, as well as future goals.

The team also worked to identify future funding partners for leveraging potential projects. This is a critical component to the implementation of recommended projects due to the limited resources available to the City. Further, any energy related savings and the return on investment are multiplied with the enhanced funding from outside partners. Many of these partners, as identified below, offer the City funding and partnerships to further enhance its commitment to reducing energy consumption.

1.1 Status of Current Operations

Prior to working on this project, Independence had already made considerable effort in promoting sustainable practices internally. This was a critical factor in the team's decision to work with them, as well as setting a baseline for moving forward following the recommendations.

The PSU team conducted a Sustainability Survey in order to better capture the complete array of activities relating to energy efficiency and sustainability in the City. The survey was conducted in tandem with the implementation of other methods for data collection, including site visits and Portfolio Manager as described previously. The survey's primary purpose was to collect direct data from department managers regarding current policies and procedures that reflect a general culture of sustainability as well as specific practices that target energy consumption. This information gathering technique was designed to help guide our recommendations for future projects. The survey was developed using the online platform Survey Monkey with questions focusing on resource conservation, sustainable modes of transportation, the working environment, waste reduction and fiscal sustainability and efficiency.

In total, six department directors and managers submitted responses on behalf of staff and in representation for the whole City. The survey enabled our team to draw some broad conclusions about the current operations at the City and current priorities in terms of managing energy usage and sustainability.

The City currently engages in these activities relating to sustainability and energy efficiency:

- Several buildings have undergone Energy Trust audits
- New City Hall has a number of sustainable enhancements, including solar panels covering 15% of energy demand
- Storm water management achieved using water absorbing tree wells in the City Hall parking lot
- Green technology being considered for wastewater treatment plant upgrade
- Proper disposal of hazardous waste
- Electronic file sharing
- Utilize web based training
- Feature indoor plants for enhanced work space
- Actively recycling materials

A complete summary of the survey questions and responses can be found at the end in the attached appendices.

1.2 Portfolio Manager

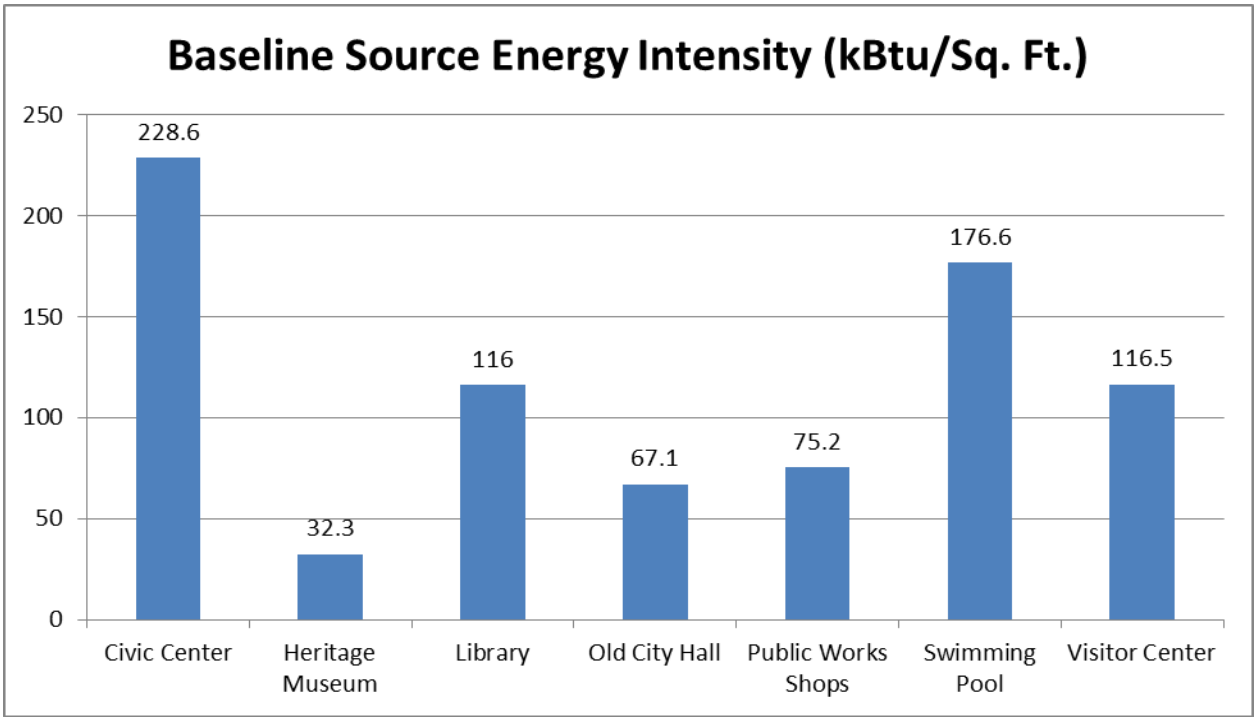
Portfolio Manager is an interactive energy management tool that allows users to track and assess energy and water consumption across an entire portfolio of buildings. Portfolio Manager can help set investment priorities, identify under-performing buildings, and verify efficiency improvements[2]

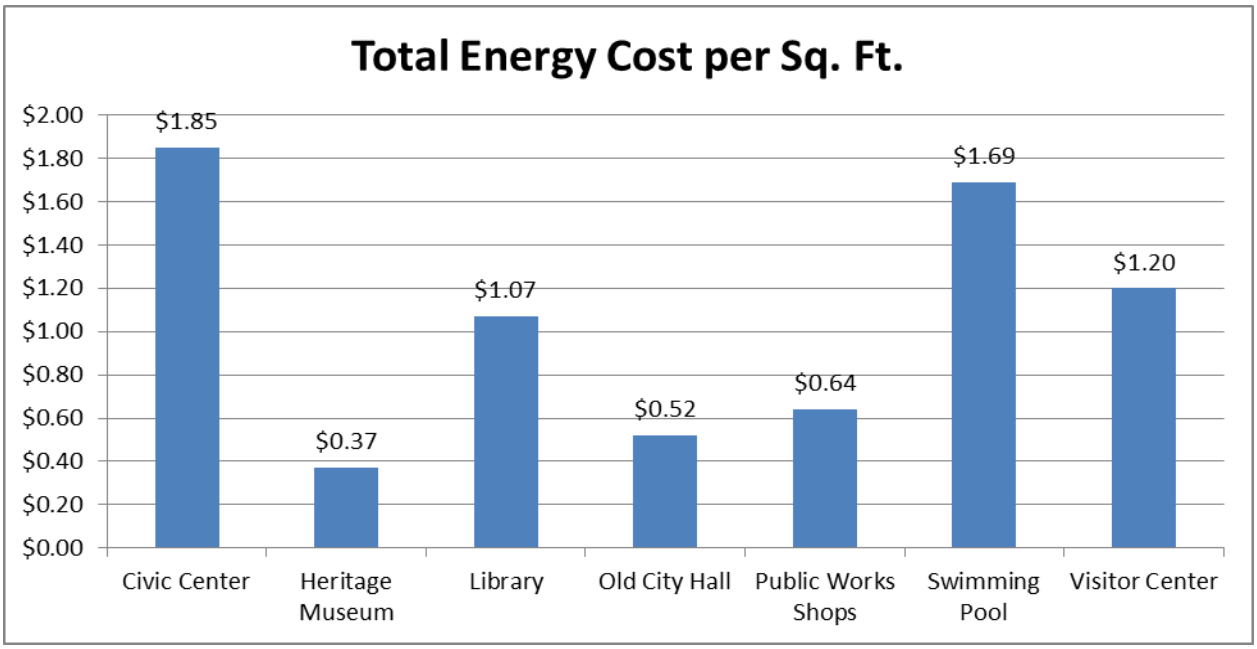
Independence was asked to implement the EPA's Portfolio Manager Application in order to help us direct initial energy efficiency efforts and track progress moving forward. The city assigned a staff member responsibility for initial set-up of the Portfolio Manager system. The initial set-up was completed by April 2012.For the purpose of this project, we focused on Weather Normalized Source Energy Intensity (SEI), which is explained in further detail below.

Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, thereby enabling a complete assessment of energy efficiency in a building.[3] Source Energy Intensity is simply the total amount of source energy used in a facility divided by the square footage for that facility. SEI allows users to compare energy usage in buildings of different size and function. SEI is available for all buildings and provides an internal benchmark for jurisdictions; for these reasons SEI is the focus of our analysis. Further normalization for weather also accounts for yearly fluctuations in weather and their impact on energy use. The Lowest (most efficient) baseline score for SEI was as 32.3 for the Heritage Museum; the highest (least efficient) SEI was 228.6 for the Civic Center.

The following Graphs represent baseline SEI and Cost comparisons for Independence buildings. The baseline data covers a twelve month period ending 1/31/2012.

[2] http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager#rate
[3] http://www.energystar.gov/ia/business/evaluate_performance/site_source.pdf?f7e7-46f1





Given the results above, we can make two preliminary recommendations. First, we suggest that Independence assign someone with knowledge of the city's facilities responsibility for updating and maintaining the city's Portfolio Manager Account. Initial set-up was conducted by an intern who operated independently and is no longer with the city, thus the current data should be double-checked to ensure that the results are accurate (the data also has not been updated beyond the baseline period). Second, assuming the results are accurate, an audit of the Civic Center would be helpful in determining why the building is not performing as expected.

1.3 Funding Partners

There are a number of different outside sources available for funding of energy efficiency projects. The list below highlights a few of the most accessible programs available in Oregon.

Oregon State Energy Loan Program[4]
The State Energy Loan Program (SELP) is available for projects that promote energy efficiency and the use of renewable energy sources. The program offers low-interest (under 3%), long term loans for projects that meet the program's criteria. Numerous projects can also be bundled under one loan. Loan amounts range from $20,000 to $20 million, with terms ranging from 5 to 20 years.

Local Utility[5]
Local utilities have several programs geared toward helping customers achieve greater efficiency. Assistance may be available for conducting energy assessments and upgrading or retrofitting of lighting and other equipment.

ESCO Contractors
Energy Service Companies (ESCO) are businesses that provide a variety of energy related services, including the implementation of energy savings projects. A big advantage of ESCO contracts is that they can allow the contractor to be paid from savings realized from efficiency projects, which allows the improvements to be funded primarily through operating budgets. Often, the contractors will assume the performance risks by guaranteeing that savings exceed the contractor's fees. Following are some ESCOs that are active in the region:

1. Johnson Control
2. Ameresco Quantum
3. McKinstry
4. Seimens

These are but a sample of ESCO contractors who are certified by the State who can finance, design and construct energy efficiency projects for local agencies.

Energy Trust of Oregon[6]
Energy Trust of Oregon (ETO) offers a number of services geared toward improving energy efficiency. ETO can help conduct energy assessments and audits, and also offers cash incentives for the installation of energy efficient equipment, as well as building upgrades. ETO services are limited to customers of Portland General Electric, Pacific Power, NW Natural, and Cascade Natural Gas.

[4] http://www.oregon.gov/energy/LOANS/Pages/selphm.aspx
[5] http://www.mc-power.com/comprograms.aspx
[6] http://energytrust.org/public-sector/

Section 2: Findings and Recommended Actions

Based on our findings through the various processes of information gathering, the PSU team and City staff compiled recommendations for both the short and long term projects in different categories. Further, there are additional energy savings activities that the City can implement. These are related to our previous compilations of best practices in the field.

2.1 Evidence Based Recommendations

The City of Independence has a number of potential projects and changes in municipal practices that will yield significant energy savings. Some could be described as "low hanging fruit," and others will take additional analysis to be sure that the project yields adequate return on investment. Listed below is a matrix that includes all project recommendations and at the end of the report is appendices giving more detailed descriptions of several of the project or policy areas. Here is a summary of the most promising projects:

Short Term

These projects either have already been evaluated by staff or could be initiated with minor review of cost/benefits:

- "Delamping," where hallways and offices have more light than is needed to adequately illuminate the area.
- Potential for using tankless hot water heaters or installing very small hot water heaters where hot water is used primarily for restrooms, e.g., City Museum, Visitors Center, Library and City Shops.
- Upgrade City Shops with a heat pump.
- Potential for converting all outdoor and parking lot lighting to LED fixtures.
- Potential for installing "inside thermal windows" where single pane windows exist, especially in historic buildings (City Museum, Visitors Center).
- Sealing Main City Pool to prevent water loss.
- Continue Portfolio Manager Software and work for automatic downloads of energy use information and giving monthly monitoring of energy conservation improvements.

Long Term

Longer term projects can be initiated now, but require more work to determine project feasibility, including costs, return on investment and funding partner potential :

- Building weatherization should be carefully evaluated by professionals to prioritize the most cost effective methods for improving each buildings energy efficiency and comfort for those that use these buildings. Portfolio Manager helps determine which buildings deserve a new look.
- Explore purchasing the municipal street lighting system from PPL and develop a conversion schedule to LED lighting. (see appendix for more detailed description of this issue)
- Installing solar hot water systems and boiler upgrade at the City Pool. Since the City Pool is only used during warmer weather, a more simple heating system would be adequate for the facility.
- Use white materials on future roof upgrades on city buildings. (see appendix for more detailed description)

- Continue upgrading of water and sewer pumping system, replacing aging, inefficient pumps and evaluate design options in new sewer system renovation. (see appendix for a detailed discussion)
- Explore opportunities to install additional micro turbines where energy can be captured and transferred to the power grid, such as sewer outfalls and water tanks.

There are other general energy savings activities the City can employ to realize future savings on an on-going basis. These include:

- Continue to invest in Computer management software to reduce phantom energy draw Motion sensing power strips
- Sustainability training for all staff
- Green purchasing model policy
- Strengthen/create Green Team
- Create a General Building Maintenance Protocol that will include descriptions of standard maintenance practices and new facility standards.
- Fleet management policies—purchasing, driving habits (see appendix)
- Explore potential for solar panel installation on buildings
- Install water saving fixtures when replaced

In addition, there are a few practices the City can employ to improve its environmental impact:

- Integrated Pest Management/use of non-toxic chemicals
- Continue transition to Native Vegetation
- Continue to reduce irrigated areas
- Continue all city operations recycling program
- Reusable dishware for all employee kitchens/meetings/events

2.2 Recommendations Summary Table

The following table summarizes each of the project recommendations by categories and recommends short/long term action according to difficulty and complexity of the project.

Focus Area	**Action Items**
Facilities: Buildings	**Short Term:** • "Delamping "office areas as appropriate • Potentially install "thermal window inserts" in historic buildings and other buildings with single pane windows • Maintain active use of Portfolio Manager for energy management • Install tankless water heaters or smaller 5 gallon hot water heaters in restrooms, City Museum, Visitors center etc • Potentially convert outdoor parking light lighting to LED fixtures • Sealing main City Pool to prevent water loss **Long Term:** • Building weatherization- likely candidates include City Museum, City Shops and Visitor's center • Explore purchasing the municipal street lighting system from PPL and develop a conversion schedule to LED lighting. (see appendix for more detailed description of this issue) • Installing solar hot water systems and boiler upgrade at the City Pool.

	• Use white materials on future roof upgrades on city buildings. • Continue upgrading of water and sewer pumping system, replacing aging, inefficient pumps and evaluate design options in new sewer system renovation. • Explore opportunities to install additional micro turbines where energy can be captured and transferred to the power grid, such as sewer outfalls and water tanks. • Create a General Building Maintenance Protocol
Operations: Fleet	**Short Term:** • Continue implementing fleet policy geared towards fuel efficiency and lower emissions • Use environmentally-friendly products in vehicle maintenance • Consider EV and hybrid vehicle purchase for replacement or new vehicle purchase where feasible • Consider cost/benefit of renewable fuel alternatives • Eliminate unnecessary idling. **Long Term:** • Develop policies for fleet purchasing (i.e. appropriate sized vehicle) • Develop anti-idling policy • Develop fuel efficient driver training program for staff
Purchasing	**Short Term:** • Review purchase use & consumption – identify needs and possible alternatives • Develop informational resource guide that details environmental feature of purchased products such as energy efficiency, non-toxic ingredients, etc.) **Long Term:** • Develop Sustainable Purchasing Policy – Prioritize the local sourcing of goods and services where possible • Perform life cycle cost assessment for purchased goods where appropriate • Provide staff training and education on sustainable procurement – Consider environmental factors when writing specifications for purchased goods and services.
Work Environment	**Short Term:** • Sustainability training for all staff • Strengthen the green team • Improve office recycling through desk side bins • Provide Reusable dishware for all employees • Increase use of alternative transportation modes (bikes, car-pool, etc.) **Long Term:** • Continued investment in Computer Management Software to improve energy efficiency and reduce phantom power draw • Develop and implement a green purchasing policy
Climate Change	**Long Term:** • Reduce irrigated landscaped areas • Integrate Pest Management/Use of Non-Toxic Chemicals • Transition to Native Vegetation

Section 3: Implementation Strategies

Sustainability Plan Project Goals—Capital Improvements Budget—Annual Review

During the annual budget review process, the municipality's Capital Improvement Plan will include a listing of sustainability/energy conservation projects identified in the municipality's Sustainability Plan. While individual Sustainability Plan actions may not meet the minimum expenditure size for typical CIP items, the CIP will include all proposed Sustainability Plan action items, grouped by category of expenditure, e.g., facilities, operations, fleet/fuel, etc.

Use of Portfolio Manager

The U.S. Environmental Protection Agency (EPA) has created a tool to assist municipalities monitor energy usage called Portfolio Manager. Portfolio Manager allows the municipality to compare the efficiency of energy usage of municipal facilities (with weather normalized data) and to track efficiency improvements over time.

The City shall install the Portfolio Manager program and update it monthly to track energy usage.

3.1 Prioritization Matrix

A good general approach in prioritizing projects is to maximize net benefit by choosing projects which offer the greatest potential for savings at the lowest cost. The model below provides a simple example by which projects in a given time period can be ranked based on benefit/cost ratio. The cumulative cost column can be used to choose projects within a specific cost limitation. Furthermore, the model can be adjusted to account for outside funding by considering only the county's costs, thus reducing the initial cost estimate for relevant projects. Although this example represents a useful general approach, it should not be adhered to in a rigid fashion.

Project	Estimated Implementation Cost	Estimated Savings per Time Period	Net Benefit per Time Period	Benefit/cost	Cumulative cost
A	100	500	400	4.0	100
B	75	175	100	1.3	175
C	200	400	200	1	375

Table 1: Simple Benefit/Cost Ranking

ETO's Pencil it Out application may be useful as an initial tool for determining potential benefits/savings of a particular project. EPA has also released several tools to assist in decisions about financing projects. The EneryStar Cash Flow Opportunity Calculator can be used to determine whether it is best to finance projects now, or wait until there is cash on-hand to pay for them.

3.2 Recommended Policies

In order to supplement the recommendations related to the projects and action items relating to energy efficiency and sustainability, Independence should also consider adopting and implementing specific Citywide policies targeting focus areas. These areas include purchasing and fiscal responsibility, fleet management, waste and energy reduction and natural resources. These policies are described below, including how the City can leverage policies to achieve long term energy goals.

Energy Reduction:
The City should consider setting goals for energy conservation for future years. This will also assist in slowing the acceleration of greenhouse gas emissions. A 2% reduction per year goal would be consistent with other regional entities in Oregon.

Waste Reduction:
Understanding that byproducts of City operations that end up in landfills are an indication of inefficient use of resources, the City may want to consider a zero waste policy. This would reframe the understanding of the byproducts of City operations from waste towards repurposing, recycling, and more efficient use of materials. Zero waste drives decisions toward greater efficiency and cost avoidance.

Natural Resources:
Ongoing protection of City natural resources on publicly owned land including water and natural habitat is critical, Develop measures that promote onsite stormwater management, increase native vegetation for habitat, reduce/eliminate the use of pesticides, (see appendices), and conserve water.

Fleet/Fuel:
The City should consider development of Fleet/Fuel policies (see appendix) that encourage the purchase of vehicles that will reduce fossil fuel usage and reduce emissions.

Purchasing:
Local governments make large procurement decisions annually and also wield monetary and symbolic influence. They bear responsibility to ensure that purchasing practices support public values. Sustainable procurement, or green purchasing, is an integrated approach, identifying how purchasing can best support long-term interests of the community. This includes reducing wasteful spending, supporting economic development through local procurement strategies, and preventing excess material waste. Independence has tremendous opportunities to implement a sustainable procurement policy (see appendix), as none currently exists. Sustainable and particularly green purchasing also directly relates to the city's efforts to reduce waste and improve energy efficiency as they can grant preference for environmentally preferred or energy efficiency purchases.

3.3 Plan Management

The success of an energy conservation/sustainability plan can only be measured by the actions that follow. Utilizing techniques and tools that facilitate successful implementation will ensure the long term viability of the program and benefit to the organization. Prior to implementation each target will go through a cost and benefit analysis. Plan implementation will be the responsibility of the City Administrator and will include:

- Integrating key elements into the City work plan
- Prioritizing action items

- Identifying staff and department commitments
- Employing a management system for annual tracking.
- Portfolio Manager is a key component of evaluating the effectiveness of implemented projects. Careful attention to both reductions in energy use and actual costs saved will provide a direct measure of program effectiveness.
- Further surveys can also be conducted to track progress in City employee's perception of sustainability efforts, and also to provide continued direction.
- Conduct a Greenhouse Gas Assessment Inventory. This will help establish a baseline for measuring the carbon footprint for all City operations and overall effectiveness of conservation efforts in the future.

3.4 Annual Reporting

To assure accountability the City should develop a management system that will assist with tracking the impacts of plan recommendations. The system should include specific indicators that identify the costs and benefits of each action item. The plan could be reviewed yearly by an auditor who can compare the results with best practices from other jurisdictions and inform future revisions of the plan. Each year will highlight key targets for the year and update recommendations based on new opportunities/constraints facing the City.

Conclusion

Independence has already taken considerable steps towards improving the sustainability of its operations, however there are measured steps the City can take as outlined in this report to continue to manage its energy consumption. The ability of the City to look at energy usage as a controllable expense will assure that resources will be maximized during periods of fiscal restraint, and excessive funds are not being expended toward the operations of facilities. Through the implementation of the recommended actions and policies, identified in this report and continued use of tools such as Portfolio Manager, the City can sit at the forefront of sustainable operations.

Appendices

Appendix 1 – Facilities and Lighting

Category: Facilities, Operations

Title: Lighting (Interior and Exterior Inclusive)

General Description: Managing "how" and how much lighting a municipality uses can significantly impact how much are spent on lighting. Some municipalities have estimated that they can save up to 40% by aggressively evaluating and upgrading lighting systems. Municipalities have used a number of strategies from simple (changing out bulbs) to more complex improvements such as day lighting work areas.

Best Practices

Municipalities have taken several approaches to improving the energy efficiency of their lighting, in parking lots, traffic signals and in buildings.

Interior Lighting: The following projects have been undertaken by municipalities:

- Florescent Tubes--Change out older T12 florescent tubes to more efficient T8. Since office work stations now require less ambient light since office workers now use computers for much of their work. Some fixtures can be "delamped." Hall ways are often "over lighted," and should be checked to see if fewer lamps are needed; sconce type florescent bulbs often are adequate to light a hallway.
- Ballast--Change out florescent tube ballast from magnetic types to electronic ballast.
- Controls--These can be occupant detection devices or photo sensors that dim or shut off lights when ambient light is adequate. One area where sensors work best is in closet/storage areas and restrooms.
- Day lighting—Look at opportunities to provide more natural lighting from skylights, light tubes and clerestory windows.

Exterior Lighting: A number of approaches to improving the efficiency of exterior lighting, for street lighting, buildings and parking areas are possible:

- Changing out exterior lights from older High Intensity Discharge (HID) lights to Low Pressure Sodium (LPS) lights. Mercury vapor HID's consuming 3 times the electricity than LPS luminaries. Also look for opportunities to convert to LED lighting where appropriate.
- Controls on outdoor lighting should be reviewed, and if not utilized, look at installing photo sensors and/or timing devices to assure lights are on only when needed.
- Evaluate the lighting levels in all outdoor areas to see if some lamps can be decommissioned, or modified to provide adequate, but not excessive lighting.

Traffic Signals: LED traffic signals consume considerably less electricity than standard traffic signals. (see appendix on LED lighting for Street Lights and Traffic Signals)

On the Horizon: Follow the changes that are occurring rapidly to provide more energy efficient solutions in lighting for municipalities:

- Cost of LED lighting will likely decrease rapidly as demand increases and production volumes allow for more efficient manufacturing. LED lights that replace florescent tubes do not appear today to be a cost effective solution unless there are cost of access issues that make longevity a key factor.
- Electroluminescent lighting has been around for some time, but now is seeing some potential applications for municipalities. They have been used for some time on automobile instrument panels and backlighting watches. Electroluminescent lighting is being used in EXIT signs. With a traditional bulb, they require around 30 watts, with LED lighting, 4 to 8 watts. Using electroluminescent lighting, an EXIT sign would draw 1 watt.

Suggested Energy Efficiency Analysis—Next Steps

Some lighting improvements will involve very low cost changes, such as:

- Delamping "over lighted" areas
- Upgrading interior fixtures, starting with the type of system (florescent, LED, electroluminescent), and installing motion detectors in appropriate locations like restrooms and other more lightly used rooms.

Larger projects may yield big savings, and will require a detailed analysis, such projects as:

- Upgrading exterior fixtures, including parking lot lights, and exterior building lights that will require changing out fixtures.
- Evaluating LED conversions for street lights and traffic signals.

Appendix 2 – Facilities and Hot Water

Category: Facilities, Operations

Title: Generating Hot Water for Municipal Applications

General Description: Heating water is a major expense in our homes, as it is in municipal facilities, be it for restrooms, showers, kitchens and swimming pools. There are two key areas where new technologies have shown to create substantial energy savings in heating water:

- **Solar hot water systems** that enhance existing water heating have been used as an energy efficiency alternative to natural gas or electric only systems in residential and business applications. Systems can be designed for cold climates as well as warmer climates and still give significant energy savings. Several different system designs are available that respond to system needs and cost considerations. Municipal applications would generally involve high water volume users, such as swimming pools, and jails and fire stations both of which may have commercial kitchens, showers and laundry facilities.

- **Tankless hot water heaters** are a relatively new technology. Some municipal facilities have large hot water tanks serving relatively minor hot water demands (e.g., restrooms). In some situations, a tankless system would be adequate for the usage, and avoids the energy costs of heating a large tank of water 24 hrs. every day.

Best Practices

SOLAR HOT WATER SYSTEMS

Alternative Systems Available

Systems fall into three basic types. A key issue is a system's vulnerability to damage from freezing. Here are the two main system types:

- Some systems have solar collectors directly connected to the electric or gas hot water heating system. Solar collectors come in many designs—some flat panel and others using a tube design. These systems can be used in colder climates, but must be drained and only provide benefits for the "non-freeze potential" months.
- A more sophisticated system involves having an anti-freeze solution pumped through the solar collectors, and then heat is transferred through a heat exchanger tank, with anti-freeze and domestic water separated. These systems are more costly, but can be used year round where water only systems would potentially freeze.

Key Decisions from an Energy Conservation Perspective

A cost/benefit analysis will need to take into account the following issues:

- Type of system—risk of freezing hazards and efficiency given climatic conditions.
- Operational considerations—easy to operate, maintain and monitor benefits.
- System sizing and cost to provide significant energy savings—the "sweet spot" between size/cost and total energy saved.
- Availability of outside funding to supplement local funds or provide creative financing approaches.

Suggested Energy Efficiency Analysis—Next Steps

A detailed analysis of the sizing, operational characteristics and financing should be done to determine the feasibility of installing a solar hot water system. Three approaches could accomplish this:

- Obtain bids from consultants with expertise in this area and then hire a firm to do the analysis.
- Contact vendors to see what level of analysis they would do with the prospect of selling their systems.
- Contact energy service companies (ESCO) to determine their interest in designing and installing systems that they would own, with installation costs covered by energy savings and ultimate transfer of the system to the municipality.

In addition, prospects for outside funding to supplement city resources should be assessed at this point.

TANKLESS HOT WATER SYSTEMS/SMALL HOT WATER TANKS

Alternative Systems Available

While **tankless hot water systems** can be designed for whole houses at the residential level, it is likely that the typical application for municipalities will be to provide hot water to limited users, like restrooms. The most likely scenario is an older building with several restrooms served by a large gas or electric hot water heater. Individual "point of use" electric tankless hot water systems are available that could fit near the sink and provide instant hot water. Multiple sinks can be served from one unit if they are relatively easy to plumb from the unit to the sinks.

An alternative that should be evaluated is replacing the existing large tank, and replacing it with a small tank, possibly nearer to the point of usage. Hot water tanks as 5 gallons could be more than adequate for a restroom where other water demands are minimal (for example for janitorial use)

Range of System Costs and Currently Available Incentives

Point of use electric tankless hot water units are relatively inexpensive, ranging from $150 to $250 for units serving a couple of sinks, to "flow controlled" units for somewhat larger applications, and they cost between $250 and $500. In addition, installation would include placing an electrical outlet near the unit's location and needed plumbing.

Small hot water tanks (5 gallons for example) cost between $200 and $300. Like the tankless alternative, the cost of electric or gas to the tank site and re-plumbing should be evaluated.

Tankless hot water systems are supported by the Energy Trust of Oregon. They currently include gas operated systems in their Existing Building Standard Incentives with a sliding scale rebate based on size ($2 to $2.50/kBtu/hr in).

Staff Analysis of the Benefit of Installing Point of Use System

It is difficult to assess how much the existing gas or electric hot water heater is contributing to the energy use of a building unless it happened to be separately metered.
If separate metering, using a temporary meter is possible, it would provide valuable information on the speed of payback for making a change in the system, such as a tankless system or a small conventional tank.

Appendix 3 – Facilities and Building Weatherization

Category: Facilities, Operations

Title: Building Weatherization

General Description: Energy usage to heat and cool buildings is a major energy consumer.

Best Practices

AUDITS
Determining what improvements to the energy efficiency of a building requires a detailed energy audit. Audits are performed by professionals that will potentially recommend upgrades to a building's insulation, windows, doors, etc.

To prioritize which buildings to perform audits on, several criteria are helpful to consider:

- Age of the building—was it constructed before commercial buildings were required to have the current requirements for insulation?
- Based on knowledge of the building, is the "R" rating of the insulation and the insulation qualities of windows/skylights/doors known?
- If the building is individually metered, does the energy consumption seem to be high for the size and use of the building?
- Is the building scheduled to be replaced in the foreseeable future, if so, they it would not be on the list for energy audits.

Cost of Installation/Metrics of Measurement/Potential Payback

An energy audit will identify the most efficient expenditures to improve the energy efficiency of a building.

Adopting Communities:

The Energy Trust of Oregon has supported a number of municipality's energy audits, a comprehensive list is available.

IDEAS TO EXPLORE

Walls: Many older municipal buildings have substandard insulation in walls. Some buildings have no insulation at all, e.g., older cinderblock construction. Some walls can benefit from "blow in" type insulation. Exterior building cladding is a possibility, but no research was found by this review on the cost/benefit of adding layers of insulating materials on the outside of a building. Furring a wall inside or outside might be feasible if a major remodel was occurring, otherwise adding wall width to accommodate insulation likely is not a good cost/benefit since the associated costs of refinishing the wall surfaces would offset for some time any energy savings.

Windows: Substandard windows in municipal buildings can be a major source of energy loss and employee discomfort. Many buildings have single pane glass, and have not been upgraded to modern, thermal pane windows due to cost, architectural issues, including the

historic status of a building. An alternative approach worth exploring is installing inside thermal window inserts that add to the R-value and reduce noise without the cost and disruption of window replacement. Interior, removable windows may be approved in historic buildings were full window replacement is unfeasible.

Roofs: Is it all black and white when it comes to the best color for a roof? Significant research has been done on roof material colors, dark or light, and the impact of color on the energy costs of buildings and other environmental issues. Generally, light or white roofs are preferred. For buildings that air condition in the summer, energy savings outweighs heat gain benefits from dark roofs in the winter. One study found that even in color climates, the gains from white roofs in the summer outweighed the heat gains in the winter. If a roof is planned to be resealed or replaced, it would be a good time to evaluate roof color. The Energy Trust of Oregon gives an incentive for going with white roofs.

Eco Roofs are also called Green Roofs or Vegetative Roofs. There are two basic categories—Extensive Roofs and Intensive Roofs. Here's the basic difference:

- Extensive roofs have a fairly shallow soil thickness (2-20 cm), usually require no irrigation or maintenance, and have stress tolerant/low plants. Usually no structural requirements needed to support the roof.
- Intensive roofs have deeper soil base (20 cm plus) and support a wide range of plants. Depending on the planting, the roof area likely requires irrigation and more maintenance than the extensive roof. Generally more structural support for the roof is required than on a conventional or extensive roof.

Eco Roofs have a number of benefits, including energy savings in the summer (a more minor energy benefit from insulation in the winter), storm water retention, prevents some heat buildup in urban areas and provides some habitat values.

Eco Roofs should be evaluated for new construction or roof replacement (likely extensive roofs only due to structural requirements). The Oregon Reach Code, the state Building Code that provides some optional means of meeting code requirements, recognizes "vegetative" roofs as an optional system to meet code requirements. The Portland State University Green Building Research Lab has developed a Green Roof Energy Calculator to allow comparison of energy savings by location of using an Eco Roof vs. conventional roof systems.

Air Infiltration: Excessive air infiltration can be cured with relatively inexpensive fixes. A comprehensive energy audit can detect where air leaks are occurring in smaller buildings. Cracks and other passages of outside air into the building can be sealed by a number of common practices, such as the use of foam sealants, caulk, door sweeps, electrical plug gaskets, etc. Can lights are common problems. In addition, sealing ductwork for infiltration can yield good results.

Appendix 4 – Facilities and Water Usage

Category: Facilities, Operations

Title: Water Usage—Irrigation

General Description: Irrigation water keeps landscaping healthy and attractive in public places. When used excessively, it is a costly resource from several perspectives. The cost of delivering irrigation water to a site hits bottom line budgets. Creating irrigation water also uses significant energy to pump it to sites, whether it is treated water or in an "irrigation water only" system using well water or recycled water.

Excessive use of irrigation water also contributes to water pollution. Run off from over-watered sites transports pollutants into storm drainage systems.

Best Practices

Municipalities have taken several approaches to prudently utilize irrigation water.

Xerascape Landscaping: Careful plant selection can significantly reduce the need for irrigation water. Drought resistant and native plants will need less water than turf or ornamental scrubs, and can reduce the cost of maintenance by municipal crews.

Cost of Installation/Metrics of Measurement/Potential Payback

Installation costs will vary greatly based on the types of planting materials and landscape plans developed for each area. These would need to be calculated on a project by project basis.

Cost savings are challenging to project since detailed data on irrigation water usage by square feet of landscaped area and by type would not typically be available. Annual rainfall and weather in general will affect usage year to year.

However, by changing vegetation in landscaped areas of existing landscaping or in areas to be newly planted, the use of drought resistant and native plants can reduce the amount of water needed by up to 50%. If roughly 20% of a municipality's landscaped areas were changed to less water dependent landscaping, then up to a 10% reduction in water usage could be attained. These statistics can be compared to the cost of installation of start to estimate the payback period using the water consumption cost for the city water system.

Metering: Metering systems to regulate landscaping sprinkler systems vary greatly in terms of sophistication. The most modern systems go beyond timers and rely on sensors to determine when and how much water should be distributed on a landscaped site. So called "Smart Controllers" are designed to regulate sprinklers or drip systems based on rainfall, soil moisture, and even tied into satellite weather tracking. Irrigation systems running during a heavy rain wastes water and sends a negative message to constituents who see this as waste.

Cost of Installation/Metrics of Measurement/Potential Payback

Evaluating the cost effectiveness would be based on a case by case analysis since a number of variables are present. However, industry data suggests savings of up to 30% can be achieved by changing to a modern control system.

Appendix 5 – Fleet and Fuel

Category: Fleet

Title: Fleet & Fuel

General Description: Fleet and Fuel covers all fleet, heavy equipment and fuel usage.

Best Practices

Fleet operations offer significant potential for reduced fuel consumption and reduced omissions. In addition to investing in more efficient vehicles, simple policy or protocol changes can increase efficiency with little monetary investment.

Implementation:

1. **CONDUCT ASSESSMENT**
    a. **Fleet**
        i. Vehicle Inventory
            1. Number of vehicles
            2. Type of use
        ii. Fuel Efficiency Assessment
        iii. Replacement cycle
        iv. "Right size" assessment
    b. **Heavy Equipment**
        i. Equipment Inventory
            1. Numbers and type of equipment
            2. Type of use
        ii. Idle Reduction potential
        iii. Biodiesel potential
    c. **Current Fuel Usage**
        i. Gallons and cost
        ii. Gas, Diesel
    d. **Alternative Fuels**
        i. Compressed Natural Gas
    e. **Vehicle Improvement Technology Assessment**
        i. Idle Reduction devices
        ii. Additional batteries for power source for lighting
        iii. Alternative power generation / power source

2. **DEVELOP PROCEDURES**
    a. **Vehicle Replacement Policy and Procedures**
        i. Strengthen language in Internal Plan/Goals.
        ii. Develop/strengthen procedure for surplus and retired vehicles
        iii. Develop form for vehicle requisition that includes fuel efficiency, appropriate sizing and fuel options.
    b. **Vehicle Replacement Committee**
        i. Define Role and Responsibility
        ii. Expand participation to all primary fleet users

3. **TRANSITION FLEET**
    a. **Increase Fuel Efficiency**
        i. Replaced vehicles to have minimum 20% increased fuel efficiency. Insure that "right size" / "right use" requirement is in place for new vehicles.
    b. **Fleet maintenance**
        i. Implement a recover, reduce, reuse program for maintenance products and processes
        ii. Utilize environmentally-friendly products in vehicle maintenance
    c. **Idle Reduction Program**
        i. Fleet - usage
        ii. Heavy equipment – signage and usage
        iii. Communications
            1. Messaging to employees
            2. Signage for vehicles, heavy equipment
            3. Inform community
        iv. Tracking benefits from implementation

    d. **Advancement of alternate transportation and fuel reduction solutions**
        i. Transportation options during work hours
        ii. Management support
        iii. Smart Driving training
            1. HR, fleet users

    e. **Partnership Opportunities**
        i. School Districts - in relation to central fueling station
        ii. Neighboring cities
            1. Collective goals/targets
            2. E85 or biodiesel
4. **FINANCING**
    a. **Grants**
        i. Federal grant opportunities
        ii. Congestion Mitigation and Air Quality (CMAQ) grant
        iii. DEQ Oregon Clean Diesel Initiative
        iv. DEQ Clean diesel tax credits
        v. Cascade Sierra Solutions
        vi. Association of Counties?
    b. **Vehicle Replacement Fund**

5. **COMMUNICATION/OUTREACH**
    a. **Employee engagement**
        i. Goal to reduce Vehicle Miles Traveled - VMTs
        ii. Mandatory or encouraged fuel-efficient driving training
        iii. Outreach materials that highlight employees' opportunities
        iv. Celebration of achievements/successes
    b. **Messaging to community**
        i. Strategy/guidelines shared with private fleets managers
        ii. Successes/goal advancements shared with community

Appendix 6 – LED Streetlight Retrofit Purchasing Policy

Category: Operations, Streetlights

Title: Light Emitting Diode (LED) Streetlight Conversion

General Description: Currently the Northwest has 1.7 million streetlights. Many of these fixtures are nearing their end of life, and are both energy inefficient and expensive to maintain.

Best Practices

Municipalities and utilities are showing more interest in LEDs for streetlights to save costs in energy consumption and maintenance while at the same time increasing customer safety. Solid-state lighting using LEDs offers huge energy savings.

Streetlight Retrofit: Local utilities typically offer several options for streetlight ownership and maintenance. Local ownership and maintenance offers opportunities to look for efficiencies in streetlight selection and related efficiencies. Pilot projects are often a good opportunity to test alternative streetlight technologies.

Cost of Installation/Metrics of Measurement/Potential Payback

In general up front capital costs for LED streetlights are more expensive however these new lighting systems can use up to 40% less energy than traditional street lighting technologies. By adding control systems these public lighting systems could save another 25%.

Maintenance costs are also reduced, with LEDs lasting up to three times longer than conventional lighting systems. Therefore over the long term LED conversions can result in significant savings for local agencies.

The Municipal Solid State Lighting Consortium (MSSLC) provides a financial analysis tool developed by the Department of Energy (DOE) to assist municipalities, utilities, and other organizations a method of analyzing the cost and return-on-investment from lighting efficiency projects.

Recent Case Studies: The Northwest Energy Efficiency Alliance (NEEA) and the City Of Seattle have conducted recent (March 2012) studies that demonstrate the effectiveness of solid-state lighting using LEDs.

Results from these tests will be combined with data from streetlight tests in other cities to create a regional design guide for Northwest municipalities. Seattle City Light has already installed 20,000 LED streetlights, showing energy savings of up to 40% compared to the high-pressure sodium lights they replaced while still making streets safer for drivers and pedestrians.

Appendix 7 – Sustainable Purchasing

Category: Purchasing

Title: Draft Sustainable Procurement Policy

General Description: The City will procure goods and services in a manner that integrates social equity within the community, environmental stewardship, and the local economy.

Best Practices

A Sustainable Procurement Policy is intended to support a diverse, equitable, and vibrant community and green economy through:

- Identifying those sustainability factors that shall be incorporated into procurement decisions;
- Prioritizing the local sourcing of goods and services when possible;
- Providing implementation guidance and empowering employees to be innovative and demonstrate leadership by incorporating sustainability factors into procurement decisions; and
- Complementing City sustainability goals and related policies.

Policy Guidelines

Environmental Stewardship

The City will consider environmental factors when writing specifications for or when procuring goods and services. The life cycle of purchases shall consider resource extraction, manufacturing processes, use, and end of life. Environmental factors include, but are not limited to:

- Depletion of natural resources
- Energy consumption
- Greenhouse gas emissions
- Impacts on biodiversity
- Pollutant releases
- Release of persistent, bio-accumulative, and toxic(PBT) chemicals
- Transportation
- Waste generation

Economic and Fiscal Responsibility

Economic and fiscal responsibility factors to be considered shall include, but are not limited to, the following:

- Use of local businesses where possible; considering availability, quality and reasonable price.
- Develop relationships with the local business community to promote sustainability
- Life-cycle cost assessment
- Leveraging buying power
- Impact on staff time and labor Long-term financial market changes

Waste reduction factors

Waste reduction factors to be considered shall include, but are not limited to, the following:

- Review use and consumption; identify need for product and possible alternatives
- Product performance, quality, and durability

Resources and Education

- The City shall provide the appropriate dedicated staff levels and related funding to support the implementation and coordination of this policy.
- The City shall provide the necessary staff education, training and infrastructure to facilitate the procurement of sustainable goods and services.

Implementation Action Measures

Social Equity

- The City shall request information from product manufacturers and service providers to help staff assess the social equity factors of purchasing specific products and services.

Environmental Stewardship

- The City will establish an informational resource that details the environmental features of products such as energy efficiency, non-toxic ingredients, etc.
- City employees will utilize the framework of the Precautionary Principle as a guide when evaluating the comparative toxicity of products and services.
- The City shall facilitate pilot testing for environmentally preferable, sustainable products.
- City employees are encouraged to use independent, third-party social and/or environmental (eco) product or service label standards when writing specifications for or when procuring materials, products, or services, so long as such labels:
    - Were developed and awarded by an impartial third-party;
    - Were developed in a public, transparent, and broad stakeholder process;
    - Represent specific and meaningful criteria for that product or service category; and
    - Indicate a recycled content percentage for frequent purchases.
- The City shall utilize product and service standards and best practices that comply with this policy. Examples include, but are not limited to, standards for minimum recycled content.

Economic and Fiscal Responsibility

- The City shall communicate with existing and potential local contractors and vendors about the Sustainable Procurement Policy and related requirements.
- The City shall educate the local business owners and goods and service providers on the evaluation criteria for determining the successful prospective contractors who incorporate sustainability factors that meet the intent of this policy.
- The City shall create a product and services database which analyzes the total lowest costs, the life-cycle cost assessment, and other essential attributes such as the costs to the environment, using available information from existing databases and case studies for sustainable purchasing.
- The City shall enhance existing practices which promote waste reduction in the work place.

Resources and Education

- The City shall establish internal policies and procedures to implement this policy and incorporate the use of sustainable products and services.
- The City shall build awareness of this policy through information dissemination, within the City and externally, and incorporation of educational materials into the Intranet, routine employee trainings, etc.
- The City shall develop buyer competency by requiring employee attendance at internal and external trainings related to sustainability and sustainable procurement.
- The City shall develop internal procedures and a structured information framework for City staff to utilize when purchasing environmentally preferable, sustainable goods and services such as standards, specification templates, tools, decision guides, local vendor lists, product lists and best practices.
- The City shall commit to a performance reporting system to analyze the effectiveness of the Sustainable Procurement Policy including policy compliance and potential areas of improvement, based on local purchasing, costs, staff time, and environmental impacts.

Appendix 8 – Best Practices Framework

With a recent emphasis on the importance of sustainability and energy conservation, a number of larger cities have adopted significant changes to their municipal operations that have yielded both environmental benefits and significant energy savings for their communities.
Small and mid-size cities and predominantly rural counties, however, often lack the resources and expertise to systematically analyze, identify, and then implement new practices and technologies that promote sustainability.

Portland State University, Hatfield School of Government (PSU) and Northwest Efficiency Alliance Inc. (NEEA) formed a partnership to develop a Sustainable Municipal Operations Playbook that documents sustainability and energy management best practices.
The goal of this partnership is to determine how a typical municipality can actively manage energy as a controllable expense by following a predetermined operating protocol.

Executive Summary

The Sustainable Municipal Operations Playbook provides examples nationwide of sustainability and energy management strategies that have prepared communities for the challenges of today and the opportunities of tomorrow. Taking a coordinated approach to sustainability optimizes return on investment, which elevates the entire organization's performance capabilities and ensures the best use of public dollars and resources.

Sustainability requires the wise and efficient use of resources. Local governments carry a significant responsibility as stewards to the community and its resources. By identifying projects in a coordinated strategic and systematic manner, municipalities will gain greater operating efficiency throughout their operations.

Our research team identified municipalities that are leaders and role models in sustainability and energy management, then conducted research and interviews to better identify how they achieved success. The Sustainable Municipal Operations Playbook identifies projects nation-wide that provide multiple benefits to the community as well as financial savings. Our research concluded that sustainability touches all sectors of the community. It plays a role in travel options and the energy used in operations and facilities, as well as the goods and services purchased.

Subsequent phases of this project will identify Oregon cities and counties that qualify as good candidates for pilot projects based on their organizational ability and capacity to implement best practices similar to those identified below.

Preparation and Planning

Laying the organizational groundwork that will ensure success is key to implementing a sustainability and energy management plan that works. Communities with the most impressive results share some common characteristics:

- Support from elected leadership and executive management to incorporate sustainable practices into municipal operations.
- Conducting a comprehensive assessment of energy usage and development of action items to reduce consumption in all areas of operations

- Setting goals and commitments related to energy reduction and implementation of sustainable practices provides a blueprint to work from now and into the future.

- Identifying funding partners for capital projects ensure that projects that have a good return on investment (ROI) are implemented.

- And finally, setting up a dedicated cross-functional work team that continues to advance sustainability initiatives and modify the plan as conditions.

Best Practices by Category

Operations- Water, Waste Water, and Storm Water Management

Up to 50% of a full service city's energy demand is accounted for by their water and waste-water management operations. In order to reduce the overall usage of energy, cities are making these operations more energy efficient to reduce their environmental impact and receive significant economic benefits.

GOAL: Reduce energy consumption in city water, irrigation, and water treatment systems	
Objective	**Best Practice**
Reduce energy consumption through pump-efficiency	• Audit agency's water and waste-water pumps and motors to identify most and least efficient equipment • Implement off-peak scheduling of pumps, motors and other energy intensive machinery where feasible • Develop and implement a motor/pump efficiency cycling schedule to use most efficient water or waste-water motors/pumps first and least efficient ones last • Develop an asset management program. Replace least efficient water/wastewater motors and pumps with more efficient units.
Make Use of Renewable Energy Sources	• Consider green power purchases through local utility company to support investment into renewable energy sources. • Install solar panels and wind turbines as new energy sources, where appropriate site conditions exist. • Analyze wastewater collection systems and outfalls and water facilities and pressure reducing valves for installation of micro-hydro turbines that meet criteria for installation (flow rates, proximity to power grid, access to site, and environmental impacts). • Install co-generation at wastewater treatment plant to convert methane gas to electricity.

Reduce energy consumption and conserve water through efficient water monitoring	• Install smart metering devices to monitor all facilities individually • Implement tiered water rate structure
Storm Water Management	• Look for opportunities to install rain gardens at city facilities and rights-of-way to treat and detain surface water on-site and promote infiltration.

Outcomes and Potential ROI on Operations/Water Management Practices:

- There is potential to save 30% to 50% of the energy consumed by pump systems through equipment or control system changes.[7]
- A study on micro-turbines by the Energy Dynamics Lab at Utah State Univ. concluded that with the right power storage system at the site, payback of the system installation could occur in as little as 5 years, however, a detailed look at cost of installation and power saved would need to occur on each site evaluated.[8]
- According to the city of Gresham's report on methane co-generation at the wastewater plant, they were able to reduce energy consumption by 50 % through co-generation and hope to be 100% renewable in five years.
- Installation of rain gardens and on-site detention can reduce storm water fees by 27% according to the city of Gresham's internal sustainability action plan.
- Thousand Oaks, CA started a solar project that provides about 15% of their waste treatment plant's electrical demand. Combined with a cogeneration project, using methane gas created through the facilities process provides up to 50% of the plant's daily electrical usage.[9]
- Lubrication Engineers saved the City of Palm Springs nearly US$ 1 million over a 20 year period by using LE 8940 MONOLEC Natural Gas Engine Oil in their three Caterpillar G399 930 HP natural gas fired engines. These engines are linked to 650 KW generators and run 24 hours a day, seven days a week.

Purchasing

The supply chains through which cities and counties purchase goods and services is often one of the highest sources of green-house gas emissions (Scope 3 indirect emissions) in a standard inventory. In order to reduce the carbon footprint and emissions, Municipalities should actively promote purchasing items that will reduce energy usage and waste. These changes can require very little up front additional costs but provide long term cost savings and energy reductions. Following the best practices guidelines in sustainable procurement will allow the municipality to purchase in line with sustainability standards, procedures and factors in an efficient way that also promotes economic growth.

[7] http://www1.eere.energy.gov/industry/bestpractices/pdfs/pumplcc_1001.pdf
[8] Renewable Energy: A Path Forward for Park City, Energy Dynamics Labs of Utah State University Research Foundation and the Jon M. Huntsman School of Business, Utah State University, 2010.
[9] http://www.fypower.org/inst/gov/project-detail.html?id=54

GOAL: Reduce energy consumption in agency purchasing by purchasing environmentally preferable products	
OBJECTIVE	**Best Practice**
Adopt a Sustainable Procurement Policy	• Purchasing Policy should require at least 30% post-consumer recycled paper. • Require all new purchases to comply with energy star efficiency standards • Establish a local purchasing preference • Establish green guidelines for purchasing recycled materials such as cartridges and toners, cleaning products, organic food or other bio-based products • Set minimum standards for the percentage of recycled-content material in at least 5 products typically purchased by the city, such as asphalt and roadbed aggregate • Reducing the amount of virgin materials in the productions of products such as asphalt reduce the overall emissions of greenhouse gases in the process and the recycling of these materials stretches public funds.

Outcomes and Potential ROI on Purchasing Practices:

- ENERGY STAR-qualified products typically use 25% to 50% less energy and can offer consumer energy savings up to 90%.[10]
- Replacing 1,000 computers and monitors with ENERGY STAR qualified products and activate power management can save up to $80,000 per year.[11]
- There is a profit/savings potential of $30.00-$80.00/ton recycled asphalt. Therefore, a municipality recycling 50 tons/day for 30 days will yield a savings/profit of $90,000.[12]

Human Resources

Sustainable operations require that the employees participate in helping the municipality to achieve goals through personal daily practices in the workplace and in their transportation to and from work. Further, full service municipalities can achieve their goals to reduce energy consumption by actively engaging employees in agency programs.

GOAL: Reduce energy consumption through employee behavior and engagement	
Objective	**BEST PRACTICE**
Improve Commute Options for Employees	• Provide agency employees with incentives to use alternatives to single occupant auto commuting • Provide flexible schedules or telecommuting where capacity allows • Provide bike storage facilities

[10] http://www.epa.gov/statelocalclimate/documents/pdf/energyefficientpurchasing.pdf
[11] http://www.epa.gov/statelocalclimate/documents/pdf/energyefficientpurchasing.pdf
[12] http://www.asphaltrecycling.com/display.php?cnt_id=24

Embed sustainability into the knowledge and behavior of employee	• Establish an interdepartmental green team to promote policy implementation, track policy adherence, conflicting policies, and suggest additional items to include to achieve additional energy reductions • Conduct employee training in sustainability best practices on a regular and on-going basis. • Include "green orientation" for all new employees

Outcomes and Potential ROI on HR Practices:

- Cost savings to employees by taking public transportation or car pooling
- Decreased carbon emissions from employees and generally decreased energy consumption

Facilities

Facilities operation represents one of the biggest opportunities to increase efficiency. In addition to seeking LEED certification for all newly constructed buildings, older buildings can be retro-fitted to increase efficiency. The first step in this process should be the conducting of energy audits and retro-fit studies to determine the best areas for potential savings. Furthermore, the necessary audits can typically be obtained at little or no cost by working with the local utility or Energy Trust of Oregon (ETO). The local utility or the ETO is also good sources for further technical assistance, as well as financial assistance for implementing projects.

GOAL: Create more efficient use of facilities by reducing consumption of energy, water, and fossil fuels; improve monitoring systems; and reduce emissions and landfill waste.	
Objective	**Best Practice**
Improve monitoring and metering systems	• Utilize an energy management system, such as EPA's Energy Star Portfolio Manager, to establish baselines, as well as to track and compare energy usage across buildings. • Install Smart Metering systems.
Replace lighting systems with high efficiency alternatives	• Replace interior lighting with CFL or other appropriate high-efficiency lighting alternatives • Install timers/motion sensors and other lighting controls to reduce unnecessary use of lighting • Replace parking and street lighting with LED (light emitting diode) lights or other high-efficiency alternatives • Replace traffic signal heads with high-efficiency LED lighting.
Upgrade HVAC systems	• Retrofitting of system controls, boilers, and other outdated equipment

Develop protocols for equipment usage	• Develop employee guidelines for equipment usage, such as turning off computers, and optimal settings for thermostats • Utilize computer pc management software system to reduce idle energy usage
Water usage/plumbing	• Upgrade plumbing systems with modern high-efficiency alternatives • Maintain and repair plumbing systems in a timely manner
Develop efficient landscaping practices	• Implement xeriscaping practices to reduce the use of water and chemicals in landscaping • Utilize drip-irrigation systems • Install Smart irrigation controllers • Establish policy to minimize use of toxic chemicals in landscaping and park maintenance
Seek alternative energy sources	• Develop an alternative energy purchasing policy • Install solar, wind, or other renewable energy generators where site conditions are favorable.
Weatherize buildings	• Update weatherization as indicated by audits
Implement a recycling program	• Develop a clear and comprehensive recycling policy for agency facilities • Provide appropriate infrastructure for recycling and waste reduction on agency facilities • Actively promote and educate employees and visitors about recycling options on agency facilities

Outcomes Potential ROI on Facilities Practices:

- Retro-commissioning (a systematic approach to optimizing building performance by identifying potential improvements to building systems and operations) has been shown to yield cost-effective energy savings of 5% to 20% with a typical payback of 2 years or less.[13]
- Lighting controls can create savings of up to 75% of uncontrolled lighting.[14]
- CFLs can create a 60% reduction in Energy usage over incandescent lamps.[15]
- Energy-efficient light commercial HVAC equipment can use up to 10% less energy than conventional equipment.[16]
- A DOE case-study indicates that implementing low-cost retro-fits and maintenance improvements, along with using control systems can reduce water consumption by up to 35%.[17]
- Traffic signals that use LED can use 80%to 90% less energy than conventional signals.[18]
- Conversion of streetlights to LEDs provides a 67% energy savings and reduced long term maintenance cost.

[13] http://www.aceee.org/research-report/a035
[14] http://www1.eere.energy.gov/femp/pdfs/om_lighting.pdf
[15] See footnote 8.
[16] See footnote 5.
[17] http://www1.eere.energy.gov/femp/pdfs/om_water.pdf
[18] http://www.epa.gov/statelocalclimate/documents/pdf/ee_municipal_operations.pdf

Fleet and Fuel Usage

Fleet operations offer significant potential for reduced emissions and reduced fuel consumption. In addition to investing in more efficient vehicles, simple policy or protocol changes can increase efficiency with little monetary investment.

GOAL: Create more efficient use of fleet vehicles by reducing consumption of fuel and reducing emissions.	
Objective	**BEST PRACTICE**
Convert to high mpg vehicles	• Consider purchase of light trucks, hybrid and electric vehicles to increase overall fleet mpg
Increase use of low-emission fuels	• Convert to blended biodiesel and other clean-burning fuels.
Develop policies that reduce unnecessary fuel consumption	• Develop idling policy to eliminate excess idling that wastes fuel and increases emissions. • Develop driver training programs which include efficiency in driving practices.

Outcomes and Potential ROI on Fleet and Fuel Practices:
HEVs usually cost $0.05 to $0.07 per mile in fuel to run compared to conventional vehicles, which cost $0.10 to $0.15 per mile in fuel to run.[19]
Biodiesel decreases emissions of particulate matter, carbon monoxide, and hydrocarbons proportional with its blend level.[20]

Additional Resources

Alternative Fuels and Advanced Vehicles Data Center: http://www.afdc.energy.gov/afdc/
US DOE, Energy Efficiency and Renewable Energy: http://www.eere.energy.gov/
US DOE, Energy Calculators and Software:
http://www1.eere.energy.gov/calculators/index.html

[19] http://www.afdc.energy.gov/afdc/vehicles/electric_benefits.html
[20] http://www.afdc.energy.gov/afdc/vehicles/emissions_biodiesel.html

Appendix 9 – Sustainability Survey

Results: The following reviews and summarizes results from each of the questions.
Question 1:

To what degree is your department or division implementing the following:							
Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
Establish building heating/cooling policies with maximum and minimum winter and summer temperatures	3	1	0	0	1	1	6
Wash vehicles at facilities using reused water	4	2	0	0	0	0	6
Conduct energy audits on buildings and facilities	2	0	4	0	0	0	6
Weatherize habitable buildings	2	1	2	0	0	0	5
Install light sensors for infrequently used building areas	1	0	3	1	1	0	6
Install water heating/saving fixtures or modify existing features to increase efficiency	3	1	0	1	1	0	6
Inventory and prioritize replacement fixtures for water conservation benefits	2	1	0	0	1	2	6
Install water saving fixtures or modify existing features to increase efficiency	2	1	0	0	1	2	6
If there are other items your department is doing to reduce energy consumption please indicate those here							1
						answered question	**6**
						skipped question	**0**

Question 2:

To what degree does your division or department implement the following:							
Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
Have bicycle racks installed at public facilities	0	0	5	1	0	0	6
Encourage employees to bike to work or to run errands	1	1	3	0	0	1	6
If there are other items your department is doing to promote clean air indicate so here							0
						answered question	**6**
						skipped question	**0**

Question 3:

To what degree does your department or division consider equipment/supplies made with recycled materials?							
Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
When making new purchases, consider equipment/supplies made of recycled material	0	1	2	3	0	0	6
Print double sided when appropriate	0	0	5	0	0	1	6
Use email or internal drives for interdepartmental file sharing	0	0	6	0	0	0	6
Switch to 100% recycled paper where paper invoices are still needed	1	1	1	1	1	1	6
Use scrap paper instead of buying new notepads	0	0	1	2	1	2	6
Scan and email PDFs as an alternative to making copies and faxing documents to citizens	0	0	3	2	0	1	6
Provide the option for electronic	0	1	0	3	1	1	6

applications, registration, billing, payments etc	
If there are other items your department is doing to protect natural resources please indicate those here	0
answered question	**6**
skipped question	**0**

Question 4:

To what degree does your division or department implement the following:							
Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
Encourage web based training	1	0	2	3	0	0	6
Have plants inside public facilities for improved air quality	1	0	2	2	0	1	6
Regularly review and implement sustainability policies with employees	3	1	0	0	0	2	6
If there are other items your department is doing to promote a quality working environment indicate so here							0
						answered question	**6**
						skipped question	**0**

Question 5:

To what degree is your department or division implementing the following:							
Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
Actively reduce publications received in the mail including junk mail, catalogs etc.	2	0	0	2	1	1	6
Recycle all recyclables (i.e. cardboard, paper, aluminum cans etc)	0	0	4	2	0	0	6
Have desk recycling receptacles and zone garbage	0	0	3	2	1	0	6

cans							
Provide recycling in building areas accessible to the public	0	0	1	1	0	3	5
Have a recycling bin next to every garbage bin	0	1	3	0	0	2	6
Promote the use of durable dish ware in public kitchens and facilities	0	1	2	1	0	2	6
Discourage the use and purchase of styrofoam	0	0	2	2	0	2	6
Donate usable items to local charities	1	0	2	1	0	2	6
Participate in organization wide swapping event to share unused materials internally	1	1	1	2	0	1	6
If there are other items your department is doing to reduce waste please indicate those here							0
						answered question	**6**
						skipped question	**0**

Question 6:

To what degree does your division or department implement the following:

Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
Encourage employee initiatives that promote sustainability and lead to fiscal savings	0	0	0	5	0	1	6
Consider life-cycle costs when making purchases	1	0	1	2	0	2	6
Actively search for ways to find fiscal savings through outside funding or by reducing energy/material usage	0	0	2	3	0	1	6

Actively follow the city's mission statement regarding providing quality public services	0	0	5	1	0	0	6
If there are other items your department is doing to promote sustainability and fiscal responsibility indicate so here							0
						answered question	**6**

Question 7:

To what degree does your division or department implement the following:

Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
Use rechargeable rather than disposable batteries	0	1	1	2	0	2	6
Regularly and responsibly dispose of hazardous waste	0	0	5	1	0	0	6
Evaluate less toxic options when purchasing cleaning supplies or other chemicals	2	0	2	0	0	2	6
Review lighting to insure usage of energy efficient bulbs	2	0	2	2	0	0	6
Look for opportunities to retro-fit existing lighting to LED's	2	0	0	2	1	1	6
Evaluate excessive lighting and opportunities for "de-lamping"	2	0	1	1	0	2	6
If there are other items your department is doing to reduce the use of toxics indicate so here							0
						answered question	**6**
						skipped question	**0**

Question 8:

To what degree does your division or department implement the following:

Answer Options	Not Applicable	Not likely to do	Already done/doing	Done/Doing in part	Have considered doing	Can or will do	Response Count
Reduce or combine auto trips between buildings or site visits or promote walking close distances	1	1	3	1	0	0	6
Purchase the smallest vehicle that the department needs to reasonably complete its work	3	0	1	1	0	1	6
Identify opportunities to introduce hybrid or electric vehicles into fleet	3	0	0	0	0	2	5
If there are other items your department is doing to reduce emissions indicate so here							0
						answered question	**6**
						skipped question	**0**