Massachusetts Department of ENVIRONMENTAL PROTECTION

RESOURCE CONSERVATION PLANNING GUIDANCE

UNDER THE TOXICS USE REDUCTION ACT (TURA)

Published in accordance with MGL c. 21I and 310 CMR 50.00

Developed in collaboration with:
Toxics Use Reduction Institute
Office of Technical Assistance and Technology
Executive Office of Energy and Environmental Affairs

v. 4/3/2018

Table of Contents

I. INTRODUCTION 3
A. WHAT IS RESOURCE CONSERVATION PLANNING? 3
B. WHAT TYPES OF NATURAL ASSETS CAN BE CONSIDERED IN A RESOURCE CONSERVATION PLAN? 4
C. WHAT DOES RESOURCE CONSERVATION PLANNING INVOLVE, AND WHAT DOES IT COMMIT MY FACILITY TO DO? 5
D. GENERAL GUIDELINES FOR RESOURCE CONSERVATION PLANNING 6

II. RESOURCE CONSERVATION PLANNING REQUIREMENTS FOR ALL ASSETS 8
A. EMPLOYEE NOTIFICATION [310 CMR 50.92(6)] 8
B. FACILITY-WIDE INFORMATION 9
1. Management Policy [310 CMR 50.93(1)] 9
2. Scope of Plan [310 CMR 50.93(2)] 11
3. Characterize Asset Use [310 CMR 50.93(2)(b)] 11
4. Identify and Rank Opportunities to Achieve Resource Conservation and Select Operations for Detailed Evaluation [310 CMR 50.93(2)(c and d)] 12
C. DETAILED EVALUATION FOR SELECTED OPERATIONS 13
1. Procedures for Identifying Resource Conservation Techniques (310 CMR 50.95) 13
2. Technical and Economic Evaluation of Resource Conservation Techniques (310 CMR 50.96 and 50.96(A)) 14
D. CERTIFICATION STATEMENTS [310 CMR 50.92(4) and (5)] 15
E. PLAN SUMMARY AND PROGRESS REPORT (310 CMR 50.97) 15
1. Resource Conservation Plan Summary Form: 15
2. Resource Conservation Progress Report 16

III. GUIDANCE FOR SPECIFIC ASSETS 17
A. Energy 17
1. Benefits of Reducing Energy Use or Using Cleaner Sources of Energy 18
2. Energy Conservation Planning 18
3. Resources for Energy Conservation 23
4. Case Study – Resource Conservation Planning -- Energy 25
B. Water 26
1. Benefits of Reducing Water Use 26
2. Water Conservation Planning 26
3. Resources for Water Conservation 32
4. Case Study – Resource Conservation Planning -- Water 33
C. Materials That Contribute To Solid Waste 34
1. Benefits of Solid Waste Reduction 34
2. Planning for Solid Waste Reduction 35
3. Resources for Reducing Solid Waste 38
D. Toxic Substance Used Below Reporting Thresholds and Chemical Substances Exempt from TURA Reporting 40
1. Toxic Substances Exempt From TURA Reporting 40

2. Toxic Substances Used in Articles and Products 43
3. General Planning Steps for Development for Toxic Substances Exempt From TURA Reporting And Non-Listed Chemical Substances 45
4. Resources for Toxic Substances Exempt From TURA Reporting and Non-Listed Chemical Substances 47

APPENDICES

Appendix A - Resource Conservation Plan Summary Form Guidance A-1
Appendix B - Resource Conservation Progress Report Form Guidance B-1
Appendix C - Resource Conservation Plan Summary Certification Statements C-1

I. INTRODUCTION

The Toxics Use Reduction Act (TURA, MGL c. 21I) and its regulations at 310 CMR 50.00, establish toxics use reduction as a central component of the Commonwealth's efforts to protect public health and the environment and to promote the competitive advantage of Massachusetts businesses through efficient materials use and management. Originally enacted in 1989, TURA requires certain facilities that manufacture, process, or otherwise use listed toxic substances in their operations above specific thresholds to file annual reports detailing their management of toxics, and to undergo a planning process to identify opportunities for toxics use reduction. The outcome of the planning process is a toxics use reduction plan (TUR plan).

Resource Conservation Planning is an opportunity for TURA filers to identify other source reduction opportunities that would produce environmental and health benefits, while improving their competitive business position.

Please see http://www.mass.gov/eea/agencies/massdep/toxics/regulations/policies-and-guidance.html for guidance on when TURA or alternative TURA planning is required.
In 2006, TURA was amended to allow TURA facilities that have completed a TUR plan and two plan updates to choose alternative planning options: they can choose to develop either a Resource Conservation Plan every other planning cycle, or to implement an Environmental Management System (EMS) that integrates toxics use reduction in lieu of further TUR plan updates. These options provide flexibility for TURA filers to focus on resource conservation opportunities in water, energy, solid waste, or non-TURA regulated chemicals and to voluntarily implement facility improvements that result in environmental and economic benefits.

This guidance document focuses on Resource Conservation Planning. Its purpose is to help TURA facilities understand the resource conservation planning process and the required elements of a resource conservation plan (see 310 CMR 50.90), and to direct them to additional resources. For guidance on implementing an Environmental Management System or on developing a TUR plan, please visit the Massachusetts Department of Environmental Protection's (MassDEP's) website at http://www.mass.gov/eea/agencies/massdep/toxics/regulations/policies-and-guidance.html.

This document should be used in conjunction with the regulations, which specify the requirements of Resource Conservation Planning.

A. WHAT IS RESOURCE CONSERVATION PLANNING?

"Resource conservation" is defined by statute (MGL c. 21I Section 2: Definitions) as "*an action that decreases the use or consumption of a natural asset such as water, energy, or raw materials, or increases the efficiency of the use of the asset, without increasing the risk to the public, including workers and consumers, or the environment and without increasing the amount of the waste generated*". The specific natural assets considered are described below in the next section (section B).

Resource conservation planning is a voluntary pollution prevention planning option for TURA filers who may not have additional technically or economically feasible TUR opportunities. Any TURA filer who has already completed a TUR plan and two plan updates is eligible to choose the resource conservation planning option. TURA filers do not have to demonstrate that there are no remaining TUR opportunities in order to choose to complete a resource conservation plan. However, in the following planning cycle after the first resource conservation plan is completed, the TURA filer must return to TUR planning (as prescribed in

M.G.L 21I Section 11). In subsequent planning years, the TURA filer can choose to alternate between TUR planning and resource conservation planning with the same asset or a different asset – in other words, they can return to resource conservation planning every four years.

The resource conservation planning option is an opportunity for companies to identify resource conservation opportunities in areas not covered by a TUR plan that would produce environmental and health benefits, while improving their competitive business position. This planning option provides companies the flexibility to use the TUR planning tool to identify source reduction opportunities within a chosen resource or natural "asset(s)" in order to reduce the use of the asset, including the amount of waste generated. In some cases, reductions in one asset may reduce the use of another asset (e.g., reductions in water use reduce energy use). However, resource conservation planning should not increase the use of one asset in order to decrease the use of another asset – unless the overall environmental impacts are reduced.

B. WHAT TYPES OF NATURAL ASSETS CAN BE CONSIDERED IN A RESOURCE CONSERVATION PLAN?

TURA filers may choose one or more of the following categories of natural assets for resource conservation planning. For each of these assets, reductions may be measured in terms of overall reductions or reductions per unit of production:

1. ***Energy:*** Reducing the amount of energy consumed and/or reducing the amount of fossil fuels used to produce energy. This includes:
   a. Energy conservation and efficiency (e.g., technologies and standard operating procedures that reduce the amount of energy consumed per unit of industrial production, which also may reduce greenhouse gasses emitted);
   b. Energy supply management (including types of energy used such as renewable energy); and
   c. Energy related to products and services (including vehicles).

2. ***Water:*** This includes:
   a. Reducing the amount of water used (e.g., demand management, conservation techniques such as water reuse);
   b. Reducing the amount of water wasted by reducing losses (e.g., fixing leaky faucets and pipes)

3. ***Materials that contribute to solid waste:*** This includes:
   a. Reducing materials use through source reduction and reuse;
   b. If no source reduction options exist, increasing recycling and/or composting of materials.

4. ***Toxic substances used below threshold amounts***: Reducing TURA chemicals (pursuant to 301 CMR 41.00) used below reporting thresholds (defined in 310 CMR 50.10);

5. ***Chemical substances exempt from TURA reporting****:* Reducing non-listed hazardous, toxic or other substances used in the facility. This includes:

a. Chemicals with emerging hazard information too new to be listed (e.g., PBDE flame retardants)
b. Other substances with low hazard, but where there is substantial opportunity for pollution prevention.
c. TURA chemicals used in processes or operations not required to report and plan under TURA
    1. janitorial products
    2. research and development
    3. pilot equipment
    4. toxics in articles[1] (e.g., reducing mercury in bulbs, switches and relays, and lead in alloys of parts included in products, but not manufactured or processed at the facility).

C. WHAT DOES RESOURCE CONSERVATION PLANNING INVOLVE, AND WHAT DOES IT COMMIT MY FACILITY TO DO?

A TURA filer that chooses resource conservation planning is committing to:

1. ***Complete a Resource Conservation Plan:*** The plan is the resulting documentation of the planning process and is similar to a TUR plan. A resource conservation plan must include:
    - Targeted asset(s)
    - A facility–wide review of the chosen asset that gathers enough information to enable identification of resource conservation opportunities
    - Identification of resource conservation opportunities in specific operations
    - A detailed assessment of the selected operations, including documentation such as a process flow diagram, baseline use of the asset, identification of resource conservation options, technical and economic evaluations of options, and an implementation schedule
    - Resource conservation options the facility plans to implement, including an implementation schedule, and other identified options not selected for implementation
    - Expected change in the use of the asset during the planning period.

    MassDEP requires plans to be completed by July 1 in even-numbered calendar years. A TURA filer that has completed a TUR plan and two plan updates may elect to develop a resource conservation plan for the next planning cycle.

---

[1] "Article" is defined in 310 CMR 50.10 as: a manufactured item, other than an item which is manufactured at the facility: (a) which is formed to a specific shape or design during manufacture; (b) which has end use functions dependent in whole or in part upon its shape or design during end use; and (c) which does not release a toxic substance under normal conditions of processing or use of that item at the facility or establishments.

2. ***Notify and solicit input from employees on the requirements of the Plan:*** Companies are required to notify and begin soliciting input from their employees on the plan at least six months prior to plan completion (i.e., by January 1 of the applicable planning year). Facility personnel in engineering, environmental compliance, marketing, finance, purchasing, sales, production, management, quality control, legal, health and safety, materials control, and research and development represent a wide range of expertise and may have resource conservation ideas or information to contribute.

3. ***Submit to MassDEP a certified Resource Conservation Plan Summary:*** A resource conservation plan summary describes the entire plan in broad strokes (similar to a TUR plan summary).

4. ***Submit to MassDEP a Resource Conservation Progress Report with the next TUR Plan Summary:*** The TURA filer must complete a resource conservation progress report (see Section II D) with the next TUR plan summary that provides qualitative and quantitative results on the progress of the resource conservation plan. For example, if a facility submitted a Resource Conservation Plan Summary by July 2008, then the facility must submit a Resource Conservation Progress Report with the next TUR Plan Summary in the next planning cycle, due by July 1, 2010.

5. ***Keep Records:*** Plans and supporting documentation must be kept at the facility for at least five years after the plan completion date and must be made readily available for review if requested by a MassDEP inspector. Please note:
   - The plan must specify the location of all referenced documentation and supporting data.
   - Calculations, assumptions, supporting data, and other documents used for the calculations must be included or referenced in the plan.
   - Analyses and calculations may be presented in the plan in a variety of ways: in their original form, whether handwritten, a formal consultant's report, a computer printout, etc. There is no need to reformat or retype the work done. As long as the information is legible, it can be included as is. Also, duplicate information may be cross-referenced in the plan.

D. GENERAL GUIDELINES FOR RESOURCE CONSERVATION PLANNING

Facilities are required to adhere to three standards in preparing a resource conservation plan:

- good faith effort
- good engineering practices
- sound accounting practices.

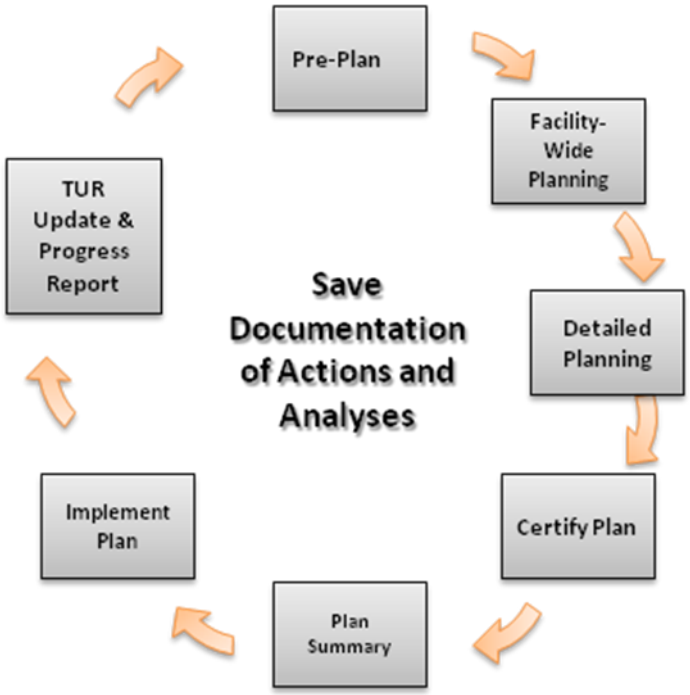
Decisions that are made during resource conservation planning and implementation are like other business decisions companies make. The analysis must be sufficiently thorough to allow

informed business decisions. In some situations, minimal analysis is appropriate or required. Other choices require careful study, monitoring, and testing. In either case the analysis must be included with the plan.

MassDEP highly recommends that facilities begin the planning process early in the year (e.g., hold their first planning team meeting no later than January or February). Experience has shown that facilities that start the planning process early have sufficient time to gather enough information to develop a meaningful and useful plan that will benefit the facility.

Facilities are not required to implement any resource conservation options they identify; however, experience has shown that when companies have completed the planning process, they often discover options they want to implement because doing so is in their best interest. If a facility decides to pursue a resource conservation option, the plan must contain an implementation schedule. While facilities are not required to abide by the implementation schedule, if a facility decides to alter or abandon the schedule, it must explain the change in the resource conservation progress report that is submitted with the next TUR plan summary.

Although the facility is required to submit only one resource conservation progress report with the next TUR plan summary (i.e., two years after the resource conservation plan is completed), facilities are encouraged to follow the TUR continual improvement process for their resource conservation plan. The TUR continual improvement process is built around four steps: plan, implement, evaluate, and review.



II. RESOURCE CONSERVATION PLANNING REQUIREMENTS FOR ALL ASSETS

Resource conservation planning allows companies to take the planning methods and skills they have used successfully to achieve toxics use reduction and apply them in a similar way to specific natural assets. This includes creating a multi-disciplinary team, tracking the flow of materials and resources, brainstorming resource conservation opportunities, assessing options, developing implementation strategies, and measuring progress. This guidance focuses specifically on how these proven strategies can be applied to resource conservation planning. Since resource conservation planning is essentially the same as TUR planning, users of this guidance should also refer to MassDEP's TUR planning guidance.

Resource Conservation Planning is a voluntary and flexible option for TURA filers.

In addition to the resource conservation planning process described in 310 CMR 50.90 and in this guidance, there are many other planning tools that a facility can use in resource conservation planning. These include tools that are specific to particular assets, such as energy efficiency. They also include different approaches, such as Design for the Environment principles that can be applied to operations or products under development. This guidance does not describe every approach, but provides references for common strategies.

The resource conservation planning regulations are flexible leaving companies free to use a process and format that works best for them, provided that all the elements and the general process required in the regulations are met. Facilities routinely compile much of the information required for an adequate plan in the normal course of their business, and are encouraged to use available data. Facilities that have recently completed an audit of one of the assets (e.g., an energy audit) may build on the audit to create their resource conservation plan.

Although the planning process is flexible, certain regulatory requirements need to be met for a plan to be certified by a TUR planner.

The following section provides a detailed explanation of the resource conservation planning process and requirements.

A. EMPLOYEE NOTIFICATION [310 CMR 50.92(6)]

Similar to TUR planning, facilities must notify all employees about the resource conservation plan and solicit ideas on resource conservation options (e.g., ways to reduce energy or water use, etc.). Facility personnel in engineering, environmental compliance, marketing, finance, purchasing, sales, production, management, quality control, legal, health and safety, materials control, and research and development represent a wide range of expertise and may have resource conservation ideas to contribute. The plan needs to describe the steps it took to notify employees. It is not necessary that the employee notice be in writing. If the facility notified the employees through a written notice, then include the written notice and a description of how and when it was distributed in the plan.

To comply with the planning requirement, the facility is required to do the following <u>at least six months</u> before the plan due date (i.e., by January 1st of each planning year):

1. Notify all of its employees of the requirements of the plan
2. Identify the asset and processes being considered for inclusion in the plan
3. Solicit comments and suggestions from employees on resource conservation options.

B. FACILITY-WIDE INFORMATION

In TUR planning, you must develop a plan for all listed chemicals used above threshold amounts in all production units. In resource conservation planning, you are not required to develop a detailed plan for all uses of an asset in your entire facility. Instead, the resource conservation plan requires a facility-wide evaluation of all uses of the asset and potential resource conservation opportunities, but allows you to choose a subset of operations for detailed evaluation of resource conservation options. The facility-wide plan requirements [310 CMR 50.93(1) and (2)] include:

1. Establishing a resource conservation management policy
2. Developing a plan scope for the chosen asset that includes:
   - Description of the natural asset chosen (e.g., water)
   - Summary of the facility's use of the selected asset, including a description of all facility operations using the selected asset
   - Description and ranking of the resource conservation opportunities
   - Description of which operations were selected for detailed evaluation
   - Summary of the process for identifying resource conservation options
   - Description of the resources conservation options considered and those selected for implementation.
3. Summarizing the expected change in the chosen asset use based on the options selected to be implemented.

Each of these requirements is described in greater detail below.

1. Management Policy [310 CMR 50.93(1)]

The management policy should be similar to and/or build upon the policy developed for TUR planning, except focus on resource conservation. As with TUR planning, strong management commitment is central to successful development and implementation of resource conservation programs. Because these programs may encompass many facets of facility operations such as process engineering, environmental management, financial analysis, and research and development, it is essential that support and coordination for resource conservation occur at the management level.

The following are two examples of management policies that address resource conservation as well as toxics use reduction:

Sample Management Policy #1

We, the management of Facility X, are committed to achieving the highest standards of environmental performance and recognize our corporate responsibility to the environment. Our company acknowledges that its operations have a direct and indirect environmental impact and aims to minimize that impact and operate in an environmentally responsible manner. We aim to produce the highest-quality products possible while identifying cost effective measures for toxics use reduction and resource conservation. In this effort, our highest priority will be the proactive pursuit of identifying processes and technologies that conserve resources, by either reducing or eliminating the use of toxics and other resources. These objectives will be incorporated into the design of new production processes, the redesign of existing processes, and the construction of new facilities. We encourage all employees to forward their suggestions for helping to conserve resources.

Sample Management Policy #2

Policy Statement

Facility Y believes that a proactive approach toward conserving and enhancing natural resources is consistent with our Core Values and fundamental to achieving our Mission. We recognize that efficient resource use and protection of the environment are vital for the continued success of our operations and provide a valuable benefit to our customers and communities. We strive to act as responsible stewards of the environment and are committed to continuous improvement. We recognize that resource conservation and environmental protection is the collective responsibility of government, business, individuals and communities. We are committed to implementing efficient and effective practices within our organization and to working in partnership with our stakeholders to pursue this goal.

Corporate Commitments

In pursuit of this policy our facility commits to the following:

- Ensure that environmental risks are properly identified, prioritized, and managed in an appropriate and timely manner
- Establish sound environmental management policies and promote best practice
- Manage operations so that they are environmentally sustainable and economically feasible, by making efficient and environmentally responsible use of energy and water, and exploiting opportunities to maximize efficiency
- Minimize environmental impact and reduce or, where practicable, prevent pollution through toxics use reduction
- Minimize waste production by reduced consumption and develop effective waste management and recycling procedures
- Collaborate with key suppliers to promote environmentally responsible procurement of goods and services
- Monitor actively results and audit policies and practices to ensure that the facility meets policy goals
- Develop an HR policy to raise and maintain awareness among staff and promote individual good practice and encourage team participation
- Recognize the legitimate interest that all our stakeholders, including customers, shareholders and employees, have in our environmental performance, and communicate openly within the facility and to the outside community.

This policy applies to all employees, departments and functions throughout the facility. The full participation of everyone is expected and necessary in order to meet the commitments set forth in this policy. This policy, and our performance under the policy, will be reviewed periodically.

2. Scope of Plan [310 CMR 50.93(2)]

The scope of plan serves as an introduction and summary of the plan. It must include:

- a description of the natural asset selected
- a summary of the facility's use of the selected asset, including a description of all facility operations using the selected asset
- a statement identifying and ranking of overall opportunities to achieve resource conservation
- a description of which operations were selected for detailed evaluation
- a summary of the process for identifying technologies, procedures, or training programs that will reduce the use of the asset and
- a description of the technologies, procedures, or training programs identified, and those selected for implementation.

A facility may choose to include additional information in the scope of plan about the planning process and the facility's environmental activities. The scope of plan cannot be completed until resource conservation options have been identified and evaluated. Though it serves as an introduction to the plan, typically facilities will finish the scope of plan once the rest of the plan has been completed. Sample plan scopes are provided for each asset in Section III.

3. Characterize Asset Use [310 CMR 50.93(2)(b)]

The facility must develop a summary characterizing the overall use of the chosen asset throughout the facility, including all of the operations in which the asset is used (across the entire facility, not just in production units that use TURA reportable chemicals). The purpose is to broadly identify and understand how, when, and where the asset is used in the facility to help pinpoint where there are conservation opportunities. Collecting this information is intended to assist in ranking opportunities to achieve resource conservation and identifying specific operations to focus on. Once the best resource conservation opportunities are identified, the second phase of the planning process involves selecting specific operations for more detailed evaluation of resource conservation options.

An effective resource conservation planning process requires a broad understanding of the use of the selected asset. There are different methods for collecting information, depending on the asset, and the amount of data collection will vary from organization to organization. You must collect enough information in order to identify, rank and select resource conservation opportunities. Section III of this guidance provides more detailed information on characterizing specific asset areas.

There are some general "survey" techniques follow:

1. *Determine appropriate level of detail* — The scope of data collection will vary from organization to organization, and from operation to operation. Data can be very specific (e.g., from sub-meters or individual processes) or may be more general (e.g., utility bills or tear sheets).

2. *Account for sources of asset use* — Find out where the asset comes from and where it goes (e.g., purchased from offsite, generated on-site, released, or sent for disposal).

3. *Document all uses* — For the sources identified, assemble bills, meter readings, tear sheets, and other use data. This data may reside in the accounting or purchasing department or elsewhere at the facility, or can be obtained from utilities, energy or solid waste service providers, or other suppliers**.**

4. *Gather at least two years of monthly data or a more frequent interval, if available***.** Use the most recent data available**.**

5. *Collect facility and operational dat***a** — To be able to normalize and benchmark, it may be necessary to collect any related data for all facilities and operations, such as building size, operating hours, etc.

4. Identify and Rank Opportunities to Achieve Resource Conservation and Select Operations for Detailed Evaluation [310 CMR 50.93(2)(c and d)]

The step after characterizing asset use is to review the information and identify opportunities to achieve resource conservation in specific operations. This is a "screening evaluation" of opportunities to achieve resource conservation of the chosen asset. For example, a facility planning team decides to target energy as their asset and conducts an energy audit to characterize the energy use and determine which facility operations provide the best opportunities for resource conservation. They determine where the most energy is being used in the facility: HVAC, lighting, machinery, and transportation. The facility then selects HVAC and lighting for more detailed evaluation of resource conservation opportunities.

In addition to the relative potential to achieve resource conservation, there may be other factors that affect your facility's ranking and selection of operations to focus on for detailed evaluation. These may include criteria such as:

- Grant or rebate availability
- Production improvements
- Marketing advantage
- Strategic business objectives
- Health and safety improvements
- Liability reduction

- Compliance costs

Section III of this guidance provides information and resources on resources conservation opportunities for specific assets. Facilities may want to engage their TUR Planner when identifying, ranking, and selecting resource conservation opportunities, or perhaps hire a consultant to provide recommendations. This step could involve extensive research and analysis, or may rely on the expert judgment of the planning team.

C. DETAILED EVALUATION FOR SELECTED OPERATIONS

Once specific operations are selected for detailed evaluation of resource conservation options, the next step is to conduct a more detailed analysis of the asset use in the operations. For each operation, characterize use of the asset (to establish a baseline) and calculate the costs of using the asset in the selected operations. Much of this information may already have been collected in the general asset characterization described above. In the detailed evaluation, develop enough information to identify specific options for the asset in the selected operations. Based on this information, conduct a technical and economic evaluation of the options and then choose the best option (or options) for implementation. Finally, identify goals for reducing the asset use and an implementation schedule for the chosen options.

The objective of detailed planning is to identify options and enough information that will allow your company to make a sound business decision on whether to implement an option.

<u>Detailed Information for Selected Operations (310 CMR 50.94):</u>

The resource conservation plan needs to identify in sufficient detail where and how the asset is used in the selected operations. This includes a process flow diagram, which is a visual representation of the movement of the asset through each relevant operation, including where the asset is lost or wasted. For electrical energy, for example, this could be a visual representation of the operations schedule including utilization and power consumption for specific equipment (e.g., pumps or compressors). The plan needs to describe the total amount of the asset used in the operation, the estimation method used in determining the amount, the purpose the asset serves in the operation, and the cost of the asset use. The process flow diagram should help with this description. Remember that the calculations and assumptions used must be included or referenced in the plan. Different standards and practices for resource/asset accounting apply to each asset area. Please refer to Section III for detailed accounting information for different assets.

1. Procedures for Identifying Resource Conservation Techniques (310 CMR 50.95)

The plan needs to include a description of how the facility identified technologies, procedures, or training programs for achieving resource conservation for the selected asset, and list those identified as potentially achieving resource conservation. This section includes:

- A list of personnel involved
- Description of information sources consulted

- Description of information gathering techniques
- List of technologies, procedures or training programs identified as potentially achieving resource conservation.

2. Technical and Economic Evaluation of Resource Conservation Techniques (310 CMR 50.96 and 50.96(A))

Next, evaluate the technical and economic feasibility of identified technologies, procedures and training programs. Facilities are not required to complete the evaluation of a particular option if it is clearly technically infeasible, will not result in resource conservation, or will have an adverse environmental impact. Likewise, an economic evaluation needs only to be done for technically feasible options, and is complete as soon as the facility has enough economic information to make an informed business decision whether or not to implement the technique.

If a facility cannot complete a technical evaluation by the time the plan is due, the plan must include a description of the options, a description and schedule of the steps to be taken to further evaluate each option, and an explanation of why the evaluation cannot be completed by the due date of the plan.

There are no explicit decision criteria for technical and economic evaluations, and the amount of analysis needed to determine that an option is appropriate or inappropriate will vary. Complete and document enough of an analysis to make an appropriate technical conclusion, which will, in turn, lead to a good business decision on whether or not to implement an option.

In the technical evaluation, the facility determines the expected reductions resulting from implementation of the technology, procedure, or training program in each operation, projected for two years from the date the plan is due; the relationship between the option and other applicable laws and regulations, and whether the option is resource conservation as defined under the Toxics Use Reduction Act.

In the economic evaluation, the facility evaluates the cost and associated savings for implementing each identified technology, procedure, and training program. The economic evaluation reveals whether or not it makes economic sense to proceed with implementing an option. It needs to be as detailed as any other capital budgeting exercise the facility undertakes.

A facility may evaluate costs and savings however it wishes, but must use the same depreciation rate, cost of capital, and economic performance criteria (e.g., payback period, internal rate of return, net present value) it would normally use for capital budgeting. Include the economic calculations performed, including assumptions used in the plan.

Describe those technologies, procedures, and training programs that the facility decides not to implement and explain the reason the options were not chosen. For those options the facility decides to implement, describe the options, the anticipated costs and savings, the expected reductions (projected for two years from the date the plan is due), and prepare an

implementation schedule. The anticipated reductions are expressed as goals for reducing the use of the asset (e.g., reduce MMBTU's by 50% by 2016).

D. CERTIFICATION STATEMENTS [310 CMR 50.92(4) AND (5)]

Once the plan has been developed, it must be certified by a senior management official and a MassDEP approved Toxics Use Reduction – Resource Conservation Planner. A senior management official is an official who has management responsibility for the persons or team completing the plan, and who has authority to act as an agent for the toxics user. The senior management official certifies the accuracy of the statements in the plan and the information in it, based on the manager's inquiry of persons immediately responsible for developing the plan. The Toxics Use Reduction Planner certifies that, in his or her professional judgment, the planning process and the plan conform to MassDEP's regulations. The certification statement, which is similar to the certification statement in a TUR plan, is included with the Plan Summary or Progress Report form. The Certification Statement is reproduced in Appendix C.

The Resource Conservation Plan Summary or Progress Report must be signed by a TUR Planner who meets the requirements of 310 CMR 50.63. The following summarizes the training and continuing education requirements of TUR Planners who wish to certify Resource Conservation plans:

- 12 credits for first certification, at least six in applying TUR planning methods to RC planning, THEN
- 9 credits every FOUR years thereafter (part of recertification), three each in energy, water, and materials found in solid waste
- No RC planning credits needed to certify RC plans that focus on toxic substances used below threshold amounts or chemical substances exempt from TURA reporting as defined in 310 CMR 50.92 (d) and (e).

E. PLAN SUMMARY AND PROGRESS REPORT (310 CMR 50.97)

1. Resource Conservation Plan Summary Form:

The plan summary form is due on July 1st of the applicable year. The resource conservation plan is kept onsite at the facility, only submit the plan summary form to MassDEP (preferably via eDEP). The purpose of the plan summary is to provide information on the resource conservation plan and to establish a baseline for measuring progress. The following reporting elements will be included in the plan summary form. They are explained in greater detail in Appendix A:

1. Asset that was selected for resource conservation planning. If more than one asset has been chosen, then a separate plan summary form must be completed for each asset.
2. Specific operations selected for resource conservation planning.

3. Baseline measure of the facility-wide use of the asset (s). This would include a baseline year, total baseline use of the selected asset, and the total use in the unit of measure for that particular asset.
4. List of the resource conservation options chosen for implementation.
5. Other resource conservation options considered but not chosen for implementation.
6. Goals for reducing the asset use as a percent reduction or a specific amount of reduction over a certain time period. (This period may be different than the two year TURA planning period.)
7. Expected measure of change in the amount of asset used (due to the options implemented) between the year on which the plan is based and two years after the plan is due. This would be a measure of the change in asset use due to the options implemented rather than expected change in facility-wide use.
8. Any additional information about the resource conservation plan that the facility would like to report to MassDEP.

Facilities will be required to report actual progress on the Resource Conservation Progress Report in two years (see below).

2. Resource Conservation Progress Report

After a resource conservation plan is completed, a facility must return to toxics use reduction planning two years later for the next planning cycle. When the facility submits its toxics use reduction plan summary, the facility also would submit a resource conservation progress report, based on the resource conservation plan it implemented two years earlier. Thus, a facility must track the progress it made in implementing its resource conservation plan and must report on that progress two years later. The following elements are included in the progress report (They are explained in greater detail in Appendix B):

1. Asset that was selected, as reported in the Resource Conservation Plan Summary.
2. Baseline amount of asset used, as reported in the Resource Conservation Plan Summary. This would include the baseline year, the total amount of asset used, and the total use in the unit of measure for that particular asset.
3. The status of the options that were selected to implement the plan.
4. Progress in reducing the asset, including the resource conservation goal(s) from Section F of the Resource Conservation Plan Summary and the goals achieved, indicated as a percentage reduction or a specific amount of reduction over a certain time period.
5. Actual change in the amount of asset used. The expected change (from Section G of the Resource Conservation Plan Summary), the actual change, and the difference between the expected change and the actual change.
6. Any additional explanation of changes in options selected, implementation schedules, and/or the actual change versus the expected change.

III. GUIDANCE FOR SPECIFIC ASSETS

The following sections provide guidance specific to each of the assets that may be included in a resource conservation plan. The elements required in a plan are covered in Section II of this guidance. The sections below follow a similar format and describe how to conduct facility-wide and detailed planning for specific assets:

A. Energy

B. Water

C. Materials Found in Solid Waste

D. Toxic Substances Used Below Reporting Thresholds and Chemical Substances Exempt from TURA Reporting

Each section includes a list of online tools, documents, and additional information that may assist you in your planning efforts. The TURA partner agencies will post additional information and reference material for specific assets on their websites to keep information up-to-date:

MassDEP's Waste & Recycling Program
http://www.mass.gov/eea/agencies/massdep/recycle/
(Resources for materials found in solid waste.)

Toxics Use Reduction Institute (TURI)
www.turi.org
(Resources for toxic substances used below threshold amounts and chemical substances exempt from TURA reporting)

Office of Technical Assistance and Technology (OTA)
http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/ota/
(Resources for energy and water use.)

A. ENERGY

Reducing energy use and increasing energy efficiency are proven strategies for cutting and controlling costs with good returns and reducing environmental impacts. Massachusetts state and local governments have initiated multiple policies and programs that promote the development of clean energy and encourage energy conservation and efficiency.

Energy conservation planning includes any beneficial reduction in energy use or losses, such as:

- *Reducing Demand through Conservation and Efficiency*: better management of existing systems and upgrades in technology.

- *Energy Supply Management*: including purchasing "green power" (such as power from renewable energy sources), building on-site renewable energy sources, purchasing combined heat and power systems, purchasing properly sized boilers and chillers, and load management (using less energy during high peak energy use periods).
- *Energy Related to Products and Services:* including reducing vehicles used or miles driven.

1. Benefits of Reducing Energy Use or Using Cleaner Sources of Energy

Resource Conservation Planning requires that resource use be assessed throughout the facility, not only in TURA production units.

Conservation and energy efficiency programs save businesses money, help protect the environment and mitigate climate change, reduce dependence on fossil fuels, and reduce the strain on the region's power supply system.

Cutting energy use by investing in more efficient equipment is one of the most cost-effective investments a business can make—the rate of return on this type of investment is often 30% or greater. Increasing energy efficiency provides other benefits besides energy cost savings; energy-efficient lighting, heating, and air conditioning often improve worker comfort and productivity. Industrial process improvements can cut material use, improve product quality, or increase output, thereby raising the return on investment.

Increasing energy efficiency also means less fuel is consumed either on-site or by power plants, thereby reducing pollutant emissions and water consumption. This results in the reduction of greenhouse gases. Additionally, the selection of cleaner sources of energy, such as installing solar panels, wind turbines or a combined heat and power system on-site, or purchasing cleaner sources of energy from your energy provider, is another way to reduce pollution. Increasing energy efficiency and renewable energy helps lower energy demand growth, which can reduce the need for new power plants and transmission lines.

The Office of Energy Efficiency & Renewable Energy's Better Plants program recognizes companies that have committed to reduce energy by 25% or more within 10 years. Visit: *https://www.energy.gov/eere/eere-success-stories-projects-map*.

2. Energy Conservation Planning

In Massachusetts, your business may be eligible for assistance through ratepayer funded energy efficiency and renewable energy programs. One of the first planning steps is to check with all of your energy service providers for technical and financial assistance programs that can help your facility identify and implement energy conservation practices. Additionally, facilities that implement innovative projects may have access to additional opportunities. The section, *Resources for Energy Conservation* (p. 22) contains descriptions of organizations and agencies that may assist your business.

The first step, is to review how energy is used throughout the entire facility. All energy sources need to be considered in this broad review (e.g., electricity, natural gas, oil, etc.). Many facilities currently track their energy use through bills and meters. Facility staff or external audits obtained through energy service professionals may be useful for this review. There are many online resources and experts in Massachusetts that can assist you. Energy experts can provide a holistic view of energy use at your facility, and provide

recommendations on cost-effective options and information on incentive programs.

Qualitatively and quantitatively analyze energy use to determine the best opportunities for energy conservation. Then, select specific operations for detailed evaluation of energy reduction options, and then decide which options to implement.

a) Sample Plan Scope For Energy Conservation

The following is an example of an energy resource conservation plan scope using a fictional facility. Please refer to Section II B (p. 10) of this guidance for more information on developing a plan scope.

Sample Plan Scope for Energy Conservation

Natural Asset Selected as the Focus of the Resource Conservation Plan
In order to improve the facility's competitive position and provide better service to its customers, Facility X selected energy use as the natural asset for its resource conservation plan.

Summary of the Facility's Use of the Selected Natural Asset
The facility identified two types of energy used in the facility: electricity and natural gas. Natural gas accounted for the majority of the facility's energy use and cost, so the assessment focused on process heating systems that use natural gas and/or energy derived from natural gas-fired systems. The company has over 30 direct-fired heating systems that use natural gas. This equipment is divided into 6 major categories: small furnaces (10), boilers (2), ovens (6), large furnaces (2), and others that include a thermal oxidizer, several dryers, etc. The plant has more than 100 make-up air units that are heated by steam produced in natural gas-fired boilers. Natural gas cost is accounted at $8.80 per million (MM) Btu. Energy (natural gas) use for the equipment is distributed as shown below:

1. Small Furnaces 34%
2. Boilers 21%
3. Ovens 16%
4. Large Furnaces 11%
5. Thermal Conversion Process 6%
6. Other 12%

-Continued-
Sample Plan Scope for Energy Conservation

Identify and Rank Opportunities for Resource Conservation of the Selected Natural Asset:
The plant has an active energy team and has already implemented commonly known ("low hanging fruit") energy saving opportunities. The facility identified the following additional potential energy conservation opportunities, ranked in the following order:

- waste heat reduction and recovery in heating systems
- upgrade natural gas burner controls
- operate equipment at design capacity to maintain high efficiency levels
- longer-term investigation of potential process changes in heating systems.

Description of Operations Selected for more Detailed Evaluation

Out of the list of conservation opportunities, the team selected four representative heating systems for more detailed evaluation: large furnace A, one small furnace, oven #32 and boiler #2.

Procedures for Identifying Conservation Techniques

The facility partnered with its energy suppliers to conduct an energy audit of the entire facility and the manufacturing practices in order to identify the operations that use energy. The assessment activities included (a) review of energy use by the plant, (b) plant tour, (c) review of heat transfer and heat recovery systems related to process heating equipment, (d) collection of specific information for input into the Department of Energy's PHAST software, and (e) further analysis of energy saving opportunities for the systems review. Three teams of personnel selected from the attendees carried out measurements. The teams were given hands-on training for data collection, use of the data for PHAST, and use of PHAST for energy saving analyses. Several additional issues related to operation, maintenance and use of new technologies were researched.

Description of the Resource Conservation Technologies, Procedures, or Training Programs Identified and those Selected for Implementation

The facility selected five options to implement:

- Tune the large furnace A burners to get proper air-fuel ratio – 2% or less O2 in flue gases. Potential savings - $80,500 per year.
- Install proper controls (temperature control or other type of closed loop control – feed rate control) for large furnace A. Benefits would be improved, production and better quality control.
- Adjust boiler burners to maintain approximately 2% O2 in exhaust gases regularly, and average current level of O2 in flue gases. Expected savings $8,380 per year, depending on current operation, adjustments, etc., (conservative with possibilities of higher savings, depending on steam production and average current value of O2 in flue gases). This can be done by using manual adjustment or tuning the burners periodically (i.e., twice a year) and by operating the boilers at as close to full load as possible to maintain efficiency of the boilers. The estimate is based on $8.80/MM Btu, 6000 hrs. /year, one boiler @15,000 lbs/hr. average steam production and reduction of flue gas O2 from 3% to 2%.
- Purchase basic instrumentation such as an oxygen/combustible analyzer to allow frequent flue gas analysis from the heating system.
- Install an economizer on boiler #2 stack for preheating combustion air.

Other Options Not Selected

The facility identified other potential process changes, but those options were not selected because of the longer payback periods, and will be considered in the future.

Assessments are generally overviews of energy use by reviewing bills and types of operations.

Audits are generally detailed assessments of different operations. See the reference section for websites with online tools.

b) Characterize Facility-wide Energy Use

The regulations require facilities to characterize overall energy use throughout the facility. Ideally, your facility should form an energy planning team to investigate, plan, and possibly implement the plan, where appropriate. The planning team should include the facility's management staff, process and production staff, along with environmental staff.

The facility may conduct an energy assessment (or audit; see sidebar) or use a recently completed assessment. Note that the facility-wide assessment of energy use must include all energy use (building, process and other equipment, vehicles) and types of energy (electricity, natural gas, oil, etc.), not only in TURA production units. Resource

conservation planning does not require knowing the exact amount of energy use for every part of your facility, but requires developing a good enough estimate to allow you to understand the relative uses across facility operations, and to prioritize energy conservation opportunities.

Typical Operations to Consider

1. Compressed Air Systems
2. Air Handlers
3. Boilers, Furnaces, Chillers, Cooling Towers (not connected to HVAC)
4. Computers
5. Fan systems
6. HVAC Systems
7. Lighting
8. Motors
9. Ovens
10. Process Heaters
11. Pumps
12. Vehicles (incl. fork lifts and offsite vehicles)
13. Other "load" areas not included above

The following steps are good practices on how to assess energy use at a facility:

Account for all energy sources: Inventory all energy purchased and generated on-site (electricity, gas, steam, waste fuels) in physical units (kWh, mMBtu, Mcf, lbs of steam, etc.) and on a cost basis. See text box for suggested equipment and systems to include in a tracking system.

Document all energy uses: For the sources identified above, assemble energy bills, meter readings, and other use data. Gather data for at least two years on a monthly basis or a more frequent interval, if available. Use the most recent data available. Energy data may reside in the accounting department, be held centrally or at the facility, or can be acquired by contacting the appropriate utilities or energy service providers.

Account for peak demand and tiered rate thresholds: Energy costs, especially for electricity, are based on more than simply the energy used alone. Utilities charge more for energy consumed above established rate tiers, and levy additional charges for peak demand, especially when those peak demands occur when the rest of the grid is experiencing high demand, such as on hot humid days. Demand management systems, including those based on internet technologies, can help to characterize a facility's energy demand by time of day and reduce the facility's stress on the grid.

Collect facility and operational data: In order to accurately normalize and benchmark data to account for other variables, it may be necessary to collect non-energy related data for all facilities and operations, such as building size, operating hours, and process specific operations information. For additional information on collecting facility data, normalizing and benchmarking, and determining load management opportunities, visit www.energystar.gov and http://energy.gov/eere/office-energy-efficiency-renewable-energy.

Collect data on individual equipment: The advent of equipment energy use databases and low-cost and easy to implement sub-metering devices can add further insight into energy usage by individual parts of a facility, or even pieces of equipment, to identify energy 'hogs' that account for increased energy use. Detailed analyses like these can reduce a facility's energy use and save substantially on costs. See http://energy.gov/eere/amo/advanced-

manufacturing-office for software and other assistance from the US Department of Energy.

Set up a tracking system to track performance. This system can range from a simple spreadsheet to detailed databases and IT systems. The assessment will provide baseline information, but tracking information over time is important since it will be used for analysis and goal setting, and eventually for tracking progress. A tracking system includes the establishment of a base year and identification of appropriate metrics, which effectively and appropriately express energy performance for your organization (e.g., energy per unit of production, ENERGY STAR benchmark score, Btu/square foot, Btu/ product, total energy cost/square foot2). Remember, the facility is seen as a "system" and all energy uses are considered at this stage. There are a number of online tracking systems, such as ENERGY STAR's Portfolio Manager and Energy Performance Indicators (EPIs) to organize data and benchmark against the industry (www.energystar.gov).

c) Identify Energy Resource Conservation Opportunities and Select Operations for Detailed Evaluation

A facility-wide energy assessment will provide you with a broad view of your facility energy use and enable you to identify, rank, and select operations for detailed evaluation. This process may include assistance from an outside energy expert, and includes both a qualitative and quantitative review of the information gathered. Once the analysis is complete, select operations for detailed evaluation.

- *Qualitative review may include:* interviews with staff to seek informed opinions, specific anecdotes, or lessons learned on specific systems (e.g., HVAC, lighting, refrigeration). It might also include any in-house audits or surveys that have been conducted, and policy or procedure reviews to determine their impact on energy use. Or, it may include research into other types of resource conservation opportunities other facilities in your industry have identified.

- *Quantitative review may include:* developing user profiles to identify energy consumption peaks and valleys, and how they relate to operations or key events; comparing performance data to similar facilities in the industry; assessing financial impacts such as high cost energy use; and analyzing gaps in data to determine where more info is needed for further analysis.

d) Detailed Evaluation of Specific Operations

In this step, your facility selects specific operations for detailed evaluation, and identifies energy resource conservation options within those operations. A description of all options identified must be included in the plan. *References for Energy Conservation* below lists resources that may help to identify options within selected operations.

For each identified option, the facility completes a technical and economic evaluation to determine the feasibility, savings and costs of implementing that option. Some of the research

[2] Note that all units should be converted to MMBTU's for TURA resource conservation planning.

may have been completed in previous steps. The analysis needs to be thorough enough to enable your facility to make educated decisions about whether or not to implement each option. If using contractors, consult with them before they begin, to determine if they will perform this analysis. If a facility chooses to implement any options, goals for energy reduction, and an implementation schedule must be included in the plan.

Facilities are encouraged to create an "audit report" as part of the plan. Using the results of the detailed evaluation, the audit report would summarize the actual steps that can be taken to reduce energy use, and would include recommendations ranging from simple adjustments in operations to equipment replacement. Estimates of resource requirements for completing actions would typically be included in this report.

3. Resources for Energy Conservation

In Massachusetts, there are many programs to help industry and businesses identify and implement energy saving projects. Energy experts from outside your facility can help you identify cost effective measures that bring immediate savings and reduce payback time. There are many online tools and manuals to help facility staff with planning. The most relevant references and assistance programs are summarized in this section. Please refer to the OTA web site at http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/ota/ for more extensive resource and assistance information.

Ratepayer Funded Energy Efficiency Programs*:* Many electric and gas utilities receive funding to provide their customers with energy efficiency programs. These programs may provide technical support and funding for energy efficiency audits and equipment rebates. Specific strategies may include enhanced energy efficiency, load management, or fuel substitution. If your energy supplier is a municipal utility, there may be limited incentive programs available – check with your utility for details. To locate your nearest utility visit the Massachusetts Energy Efficiency Partnership's Utility Finder at: http://maeep.org/utilitydsm.

Renewable Energy Programs: The Massachusetts Clean Energy Center accelerates job growth and economic development in the state's clean energy industry. This quasi-public agency serves as a clearinghouse and support center for the clean energy sector, making direct investments in new and existing companies, providing assistance to enable companies to access capital and other vital resources for growth, and promoting training programs to build a strong clean energy workforce (www.masscec.com).

Energy Services Companies (ESCOs): An ESCO is a business that develops, installs, and finances projects designed to improve energy efficiency and reduce costs for facilities. ESCOs generally act as project developers for a wide range of tasks, and assume the technical and performance risk associated with the project. See the National Association of Energy Service Companies (NAESCO) www.naesco.org or Northeast Energy Efficiency Council www.neec.org for listings of ESCOs in this area.

Massachusetts Demand Response and Forward Capacity Market Incentive Program: Demand Response programs compensate large electricity users for reducing consumption when market prices are high or demand is high and system reliability is at risk. Users may choose from among different options designed to fit their needs. The Forward Capacity Market is used to purchase sufficient capacity – including energy efficiency - for reliable system operation for a future year at competitive prices where all resources, both new and existing, can participate. ISO New England, the operator of the electric grid in New England, offers Demand Response and Forward Capacity Programs: www.iso-ne.com/index.html.

Massachusetts Technical Assistance Programs: The state offers a number of incentive and technical assistance programs through state agencies, educational institutions and non-profit organizations:

- The Office of Technical Assistance and Technology (OTA) within the Executive Office of Energy and Environmental Affairs provides on-site technical assistance, workshops, regulatory assistance, and technology development programs to all businesses, including those that report under TURA: www.mass.gov/envir/ota.
- The Center for Energy Efficiency and Renewable Energy (CEERE) is located at the University of Massachusetts/Amherst, and provides technological and economic solutions to environmental problems resulting from energy production, industrial, manufacturing, and commercial activities, and land use practices. CEERE houses the Renewable Energy Research Laboratory, the Building Energy Efficiency Program, the Energy and Environmental Services Program, and the Industrial Assessment Center. The Industrial Assessment Center provides technical assistance and audits to small to medium-sized manufacturing facilities, and runs the Combined Heat and Power Initiative: www.ceere.org.
- Northeast Energy Efficiency Partnerships (NEEP) is a regional non-profit that promotes energy efficiency through a number of initiatives. NEEP houses the Premium Energy Efficiency Motors Initiative, promoted by the National Electrical Manufacturers Association, the High Efficiency Commercial Unitary HVAC Initiative, the High Efficiency Commercial Lighting Initiative, Commercial and Industrial Information Exchange, and provides Building Operator Certification Training: www.neep.org.
- Mass Save is an initiative sponsored by Massachusetts' gas and electric utilities and energy efficiency service providers, including Columbia Gas of Massachusetts, The Berkshire Gas Company, Cape Light Compact, National Grid, Liberty Utilities, NSTAR, Unitil, and Western Massachusetts Electric Company. The Sponsors of Mass Save work closely with the Massachusetts Department of Energy Resources to provide a wide range of services, incentives, trainings, and information promoting energy efficiency that help residents and businesses manage energy use and related costs. The program offers financial incentives and technical assistance to commercial, industrial, and institutional customers who are building new facilities or undergoing a major renovation; adding capacity; or replacing or upgrading equipment: https://www.masssave.com/en/saving/business-rebates/.

Federal Assistance Programs: The two primary federal agencies that promote energy efficient products and practices are the U.S. Environmental Protection Agency (US EPA) and the U.S. Department of Energy (US DOE). They jointly run the Energy Star Program www.energystar.gov that provides excellent tools for measuring current energy performance, benchmarking, normalizing, setting goals, identifying options, and tracking savings. They focus primarily on buildings, however, the Energy Star for Industry program is tailored for industrial facilities. The Portfolio Manager tool that assists facilities in measuring, tracking, and identifying options for energy reduction and the Building Design tools may be particularly useful.

The US DOE runs the Office of Energy Efficiency and Renewable Energy (EERE) www.eere.energy.gov, which manages the Advanced Manufacturing Office (AMO) http://energy.gov/eere/amo/advanced-manufacturing-office. The University of Massachusetts/Amherst houses the regional ITP through the CEERE program listed above. This program partners with U.S. industry to improve industrial energy efficiency and environmental performance. Grants and other financing opportunities, along with research and development programs, are provided that seek to reduce industrial energy requirements, while stimulating economic productivity and growth. The program's primary focus is on process equipment. Of particular note, is the US DOE's Office of Industrial Technologies' Best Practices Program that has a number of online assessment tools for major processing equipment (general assessments and specific processing equipment such as motors, combined heat and power, air compressors, fans, etc.).

The following case study of an exemplary Energy Resource Conservation plan. It is one of a series developed to highlight techniques for saving money and reducing the use of energy, water, or materials in solid waste.

4. Case Study – Resource Conservation Planning -- Energy

Case Study – Resource Conservation Planning -- Energy

Philips Lightolier has adopted several energy efficiency measures that have saved the company close to one million dollars annually. The facility, which manufactures lighting systems, reduced energy consumption for its own lighting needs and enhanced the efficiency of its air compression system by monitoring compressed air movement and upgrading factory lighting. Improving the compressed air system reduced electricity use by 531,951 kWh and saved approximately $66,000 in annual energy costs. In addition, Philips Lightolier replaced all of its lighting and fixtures with more energy efficient models. This project reduced electricity use by 570,000 kWh and saved close to $71,000 per year. In total, these energy efficiency measures have saved the company 1,101,951 kWh and $137,000 annually. Thanks to an incentive program through National Grid, Philips Lightolier reduced its out-of-pocket costs by nearly 70 percent for these energy efficiency projects from $237,921 to $76,511. Both of these projects had payback periods of less than nine months. Since OTA last worked with Philips Lightolier, the company implemented new projects to reduce natural gas and electricity use, including phasing out rooftop heaters and using heat generated from the new powder coating line for 50 percent of the factory's comfort heat. This has reduced natural gas consumption by 42 percent and has saved $345,000 from 2007-2011. Additionally, Philips Lightolier has recently completed the installation of a 2.0 MW wind turbine generator. The turbine is expected to save the company $480,000 in annual energy costs.

This case study is available on OTA's website at:
http://www.mass.gov/eea/docs/eea/ota/case-studies/lightolier-energy-final.pdf

B. WATER

Effective water conservation can range from simple methods of reducing water consumption, to sophisticated technologies to completely eliminate water use. The US Environmental Protection Agency (US EPA) estimates that, through the installation of water-efficient equipment and integration of water-reducing practices into everyday operations, a 30% reduction in water consumption is typically possible at a facility.

In Massachusetts, the Water Conservation Standards (updated in June 2012), published by the Executive Office of Energy and Environmental Affairs and the Water Resources Commission, set statewide goals for water conservation and water use efficiency, and provides guidance on effective conservation measures to meet the statewide goals (http://www.mass.gov/eea/docs/dcr/watersupply/intbasin/waterconservationstandards.pdf). With the rising costs of water, wastewater treatment, and the energy used to heat water, businesses can save money by reducing water use through resource conservation planning.

Water conservation planning includes any beneficial reduction in water use or losses:

- Reducing the amount of water used through demand management (e.g., using ultra low-flow toilets and automatic shut-off faucets) and conservation techniques (e.g., reusing water that would otherwise be discarded such as treating water from sinks for use on landscaped areas).
- Reducing the amount of water wasted by reducing losses (e.g., fixing leaky faucets and pipes).

1. Benefits of Reducing Water Use

Increasing water use efficiency can provide a competitive advantage for businesses by reducing operating costs (lower water bills, electrical power costs and chemical costs for water treatment) and reducing wastewater treatment costs (including costs of treatment chemicals). Water conservation can improve the performance and longevity of septic systems, benefiting the users of such systems as well as the integrity of adjacent surface and ground water. Water conservation also benefits public water suppliers by reducing the need for additional plant capacity for pumping and treating water and avoiding the costs of investing in new sources of water.

Finding ways to use less water can result in savings through lower electrical power costs and reduced chemical costs for water treatment.

Businesses can save significantly by decreasing their water use. Payback periods for implementing water demand reduction measures are generally low, between 1-4 years, with an average payback period of less than 2.5 years.

2. Water Conservation Planning

The first step, is to review how water is used throughout the entire facility. Many facilities

currently track their water use through bills and meters. This information is then analyzed to identify the best opportunities for water conservation. Facilities then select specific operations for detailed evaluation of water reduction options and decide which to adopt.

a) 1. Sample Plan Scope for Water Conservation

The following is an example water conservation plan scope using a fictional facility. Please refer to Section II B (p. 10) of this guidance for more information on developing a plan scope.

Sample Scope of Plan for Water Conservation
Natural Asset Selected as the Focus of the Resource Conservation Plan Facility X selected water as the natural asset for its resource conservation plan. Summary of the Facility's Use of the Selected Natural Asset The facility uses 19.2 million gallons per year of town-supplied water. The facility uses an estimated 14.2 million gallons of water per year in their production processes, and an estimated 5 million gallons of water per year for cooling tower makeup, sanitary purposes and general cleanup. Of the 5 million gallons, about 3.12 million gallons is rejected from its high purity water treatment process. Identify and Rank Opportunities for Resource Conservation of the Selected Natural Asset: The facility identified the following potential resource conservation opportunities, ranked in the following order: • High purity process makeup water – 12.48 million gallons/year (65%) • Process reject stream – 3.12 million gallons disposed/year (25% of the makeup water) • Plating rinse water – 1.92 million gallons/year (10%) • Cooling Tower – 3.26 million gallons/year (17%) • Other non-production losses – 1.3 million gallons/year (7%) • Sanitary sewer – 1.15 million gallons disposed/year of total discharge (6%) Description of Operations Selected for more Detailed Evaluation The facility decided to focus on the following facility operations for more detailed evaluation: • The water purification system in the high purity process makeup operation • Cooling tower • Non-production losses • Plating rinse water Procedures for Identifying Resource Conservation Techniques In 2012, the facility used the Massachusetts Water Resource Authority (MWRA) to conduct a Water Efficiency Study and identified several Water Efficiency Measures (WEM) that, if implemented, would have a combined estimated savings of 5.5 million gallons/year with a payback on investment of about 2 years. The facility manager reviewed records from MWRA, reviewed national wastewater data from similar facilities, reviewed purchasing records, and met with facility staff to determine the amounts of water used and wastewater generated, the facility operations to focus on, and options for reducing the amount of water used. Description of the Resource Conservation Technologies, Procedures, or Training Programs Identified and those Selected for Implementation: The facility selected three options to implement: Replace two of the filter membranes in the ultra filtration and reverse osmosis units in the high purity

Sample Scope of Plan for Water Conservation
water treatment system. The total replacement cost for this measure is estimated at $34,000. With estimated water and sewer savings at $42,500, payback for this measure is 0.8 years. After upper management reviewed this option, they realized the cost-effectiveness of the membrane replacements and long-term lifecycle benefits, and decided to replace not only the UF and RO units, but also to upgrade the entire water treatment system by replacing all pretreatment and process equipment including sand filters, ion exchange units, carbon filters, mixed bed deionization units, particulate filters, ultraviolet treatment, and polishing units. The total implementation cost for the project is estimated at $135,000. • Reduce non-production period losses through valve replacement and employee training. Replace valves and train employees on the significance of water conservation. There is no implementation cost attributed to training employees, except for staff time. The valve replacements will be accounted for as a normal operational expense and no monetary investment is required to implement this measure. These measures have an annual savings potential of 190,000 gallons per year. • The older equipment that was removed from the water purification system (old RO unit, cation/anion system, and some old pumps) can be modified to allow rinse tanks to go through a closed-loop system. The initial investment for this measure is $5,000, and consists of piping and electrical hookups. The net water savings from this measure is estimated at a projected 1.2 million gallons a year. <u>Other Options Not Selected</u> Use the RO and UF reject streams from the purification system for cooling tower makeup. This measure has a lower annual savings of 657,000 gallons, and would need additional investment for cooling tower hookup, but will be evaluated in the future.

b) <u>2. Characterize Facility-Wide Water Use</u>

<u>Typical Operations to Consider in a Water Audit</u>

1. Heating and Cooling (evaporative cooler and/or cooling tower make-up, boiler blow-down, etc.)
2. Kitchen Plumbing (ice machines, food preparation, dishwashers, etc.)
3. Landscape Irrigation
4. Laundries
5. Process Water (process cooling, rinsing operations, chemical dilution, waste pre-treatment)
6. Domestic Plumbing (restroom consumption such as toilets, urinals, showers, and faucets)
7. Water Features (pools, spas, fountains, etc.)

Assessing water use and losses is the first step in designing an effective water conservation plan. If you keep track of water use information, regularly check for leaks and whether operations are running optimally, you will know where and how you use water in your facility. If you do not know this information, have a water audit conducted to survey all water-using or conveying fixtures, plumbing, equipment, and practices. The water audit results will serve as the starting point for identifying water uses, losses, and conservation practices, and for recommending improvements.

Ultimately, the water audit should give you a water balance:

Consumption = water in + evaporation + leaks + (waste) water out + water in product

The water balance will provide you with an estimate of the total amount of water that your facility consumes on a daily and annual basis. Resource conservation planning does not require knowing the exact amount of water used for every part of your facility, but you need to develop a good enough estimate to allow you to understand the relative uses across facility operations, and to prioritize resource conservation opportunities.

An audit for a large facility that uses large quantities of water can be a significant undertaking. The following steps provide some general guidance on how to survey water use at your facility. In addition, there are many online resources (see *Resources for Water Conservation*, p. 32) and qualified consultants that can help you perform an audit. Check first with your local water and sewer utility for possible assistance.

1. *Identify your source of water:* Where do you get your water? Is it from an off-site municipal supplier, an on-site community water supply, an on-site private water supply, a surface water body, or a combination?

2. *Gather all existing documents and sources of information, including:*
   - Water (indoor and outdoor) and sewer bills. Contact your local water utility to obtain a complete list of all meters serving the facility, and, if possible, the type of use that each meter serves (landscape, fire line, etc.). By recording both the billing account number and the meter number (usually stamped on the dial cover of the meter), you may be able to determine which meters serve a particular building or area of the facility. Quantify all sub-meters as well, which will provide you with a better record of the amount used by a particular piece of equipment or operation.
   - Maps, schematics, and floor plans of the distribution system, plumbing and equipment, and prior water and energy surveys.
   - Number of employees/occupants and their schedules. Does your facility have shifts covering 24 hours? These factors make a difference in the magnitude of your water use.
   - Any paperwork (e.g., owner's manuals) related to water-using equipment, appliances, fixtures, pumps, etc., that has information on capacities, storage and water use of all appliances, fixtures, pumps, hoses, rinse tanks, cooling towers, recycling ponds, and other water-using equipment and structures. You may have to call the manufacturer or installer to obtain this information.

3. *Quantify your facility-wide water use from each water source:* For businesses with meters, it is very easy to quantify facility water use by recording the meter readings at the beginning and end of a 24-hour period, and subtracting the initial reading from the final reading. This is the amount of water you used on that day. Repeat this several times and average the daily readings. Also consider whether there may

be significant seasonal fluctuations in water use.

If the facility is not metered, you will need to estimate water use based on the use and type of equipment you have, employees/occupant numbers, and the information gathered above. You may also use a portable, non-invasive, ultrasonic water meter to measure flows at various points in the facility. This is a device that clamps onto the outside of pipes and uses ultrasound to measure water flow through the pipe. This equipment requires a pipe diameter of at least 1.5 inches and does not perform well on some PVC piping.

4. *Conduct an on-site survey:* The information collected in steps 1-3 above details where and how your facility uses water and serves as the foundation of the water survey. Take a walk-through and observe how water is used in the facility. The walk-through is an opportunity to involve others in brainstorming ideas on how to achieve reductions in water used. Different people can conduct the survey with several parties at once, or at different times, as long as various perspectives are shared.

   The scope of a water survey will depend upon the size of the building, the complexity of its systems, and the survey budget. The more comprehensive the survey, the greater the value the resulting water management options and cost savings. The survey could include:

   - Catalogue water-using devices and measure daily use of each. Note the number of each device, the manufacturer, and the amount of water each device uses. Don't forget to include fixtures and practices employed in outside water use. (For example: three low-flush American Standard toilets at 1.6 gallons per flush each.)
   - Identify and quantify consumption and water leaks for each device. This can be as simple as comparing manufacturing specifications with meter readings, if you have a portable meter. If the device uses more water than the manufacturer recommends, then there is a possible leak. Use the Waterwiser Drip Calculator to quantify leaks: http://www.awwa.org/resources-tools/public-affairs/public-information/dripcalculator.aspx. For un-metered facilities, estimate the 24-hour water use of each device. (For instance, multiply the flow rate of a garden hose in gallons per minute times the number of minutes of use.)
   - Characterize operational practices. If you observe employees controlling the use of water, observe whether or not they are careful to conserve water, and solicit ideas from them on how they might minimize water use.
   - Identify and quantify water conservation devices and practices already in place. Quantify the savings compared with conventional devices and methods.

5. *Categorize water use:* After gathering water use information and completing the inventory of water uses around the facility, you may want to group the uses by category and estimate a water balance. There are a number of online water balance

worksheets and spreadsheets to help facilities gather this type of information. (See *Resources for Water Consumption*, p. 32, for additional references.)

c) Identify Water Conservation Opportunities and Select Operations for Detailed Evaluation

After characterizing the facility's water use, rank water conservation opportunities for detailed evaluation. By grouping the various water uses into categories, you will be able to verify which categories use the largest amounts of water. This information should help you identify the best opportunities for resource conservation and select specific operations for detailed evaluation. For example, if the cooling system accounts for half of your facility's total water consumption, this could be a good area on which to focus conservation efforts.

In identifying and ranking resource conservation opportunities, consider both qualitative and quantitative information. Gathering qualitative information may include interviews with staff to seek opinions, anecdotes, or lessons learned on specific facility systems (e.g., process water systems, heating and cooling systems). It might also include reviewing any surveys, policies or procedures to determine their impact on water use, and researching what other facilities in your industry have done to reduce water use. Consideration of options should involve those who would have to implement them. Quantitative information may already have been gathered in a water audit which identified how water use relates to operations and key events. It may also include comparing your facility's performance data to similar facilities in the industry, and assessing the financial impacts of your water use and discharge. It also needs to identify any data gaps to determine where more information is needed.

The approach to evaluating water savings opportunities for each water use category needs to be thorough enough to identify promising opportunities for resource conservation. You may want to consider developing a forecast of future water use. This forecast considers historical water demand, future expansion, employee/occupant increases or decreases, planned water conservation practices, retrofits and upgrades, and weather conditions and trends.

d) 4. Detailed Evaluation of Specific Operations

After a facility has ranked opportunities for resource conservation and selected specific operations, it then identifies and evaluates specific water conservation options within each selected operation (e.g., options for cooling systems, options for landscaping). Include a description of all options identified in the plan. *Resources for Water Consumption* below includes resources that may help to identify and evaluate options.

While equipment replacement may be an option, it may not necessarily be the first place to look. Often, simple procedural changes in maintenance or operation can produce substantial water savings. A constantly running toilet, for example, can waste 4,000 gallons of water per day. Checking and replacing valves and ball-corks regularly can save this otherwise wasted water.

The next step is to complete a technical and economic evaluation to determine the feasibility, savings, and costs of implementing identified options. If using contractors, consult with them before they begin, to determine whether they will be able to perform this analysis. Some of the research may have been done in previous steps. There is no prescribed way to complete this

analysis. It needs to be thorough enough to enable your facility to make educated business decisions about whether or not to implement each option. The plan must include reduction goals and an implementation schedule for each option the facility plans to adopt.

3. Resources for Water Conservation

Water authorities, municipalities, and the Commonwealth of Massachusetts regulate water use and discharge. Businesses should first check with their water and/or sewer authority to determine if they have any specific programs available to assist them in their water conservation projects. Also, there are many consultants that specialize in water conservation and auditing that can assist you.

OTA's web site at www.mass.gov/envir/ota contains extensive resource and assistance information on water use reduction. OTA offers on-site technical assistance visits and has online a number of best management practices and case studies for selected industries.

Water and Sewer Utilities: Municipal water and sewer utilities are the gatekeepers to water use and discharge in their communities. Check with your local water and sewer utility to see if there are specific eligible business conservation programs. One of the largest water and sewer utilities is the Massachusetts Water Resources Authority (MWRA): www.mwra.com/index.html. MWRA has an Industrial, Commercial and Institutional Water Management website with case studies (www.mwra.com/04water/html/indust.htm).

Massachusetts Watershed Associations and Planning Councils: Massachusetts has a number of associations and councils that work to protect rivers, streams and adjacent lands. A number of them have worked with businesses on water conservation projects. A list of these associations and councils can be found at the Division of Ecological Restoration at: http://www.mass.gov/eea/agencies/dfg/der/technical-assistance/watershed-contacts.html.

Massachusetts Water Standards and Regulations: In 2012 the Water Resources Commission updated the Commonwealth's *Water Conservation Standards,* (http://www.mass.gov/eea/docs/dcr/watersupply/intbasin/waterconservationstandards.pdf) which set statewide goals for water conservation and water use efficiency, and provides guidance on effective conservation measures to meet the statewide goals. This document recommends that the industrial, commercial and institutional sectors complete water facility audits, and it contains sample audit worksheets. It also lists best management practices for selected industries.

MassDEP is responsible for ensuring clean water and making sure that wastewater is managed properly. If you are considering water reuse projects or would like tips on water conservation, visit the MassDEP's website at: www.mass.gov/dep.

Federal Resources: The US EPA runs the WaterSense Program, which is a voluntary partnership program to help promote and enhance the market for water-efficient products and services. There are a number of documents and tools to assist businesses in identifying

water efficient products, finding consultants, and tip sheets: www.epa.gov/watersense. The EnergyStar Program also includes water in their tracking, since reducing water use usually affects energy use, including the Portfolio Manager that lets you track water use and bills from indoor and outdoor uses along with wastewater: www.energystar.gov/index.cfm?c=business.bus_water.

Other Assistance and Tools: There are a number of water associations that provide water conservation services, online tools, and assistance, such as the American Water Works Association (www.awwa.org/waterwiser) and the Alliance for Water Efficiency (www.allianceforwaterefficiency.org). A general web search of "water conservation resources" and "water efficiency" will also provide a wealth of tools, fact sheets, and other online resources. States with dry climates and/or historical water issues (e.g., Arizona, California, Florida) have developed good online resources for businesses.

The following is a case study prepared by MassDEP of an exemplary Water Resource Conservation plan. This case study is one in a series developed by the Massachusetts Department of Environmental Protection (MassDEP) to highlight techniques for saving money and reducing the use of energy, water, or materials in solid waste.

4. Case Study – Resource Conservation Planning -- Water

Case Study – Resource Conservation Planning -- Water

Through a commitment by company management and a series of process changes, Philips Lightolier reduced their water consumption by 64 percent and saved nearly $242,000 annually starting in 2007. The company put together a team from different departments to evaluate manufacturing operations to find water conservation opportunities. By installing new equipment to reduce water pressure and improve the efficiency of rinsing processes, Philips Lightolier reduced annual water use by 58 million gallons. The cost for the changes was about $65,000 and the payback period was only three months. By updating current technology and implementing new conservation mechanisms, Philips Lightolier achieved significant water reductions throughout its entire facility.

This case study is available on OTA's website at:
http://www.mass.gov/eea/docs/eea/ota/case-studies/lightolier-water-final.pdf

C. MATERIALS THAT CONTRIBUTE TO SOLID WASTE

There are many ways that a facility can reduce the solid waste it generates and save money at the same time. Facilities can identify opportunities for resource conservation by evaluating their production processes, product life cycles, purchasing practices, and material use, to identify "upstream" opportunities that will reduce the amount of waste produced. Massachusetts has set an aggressive 80% waste reduction goal by 2050 in the *Final 2010-2020 Solid Waste Master Plan: A Pathway to Zero Waste*, (www.mass.gov/dep/recycle/priorities/dswmpu01.htm#swmp) which includes policies and programs to encourage businesses and communities to reduce their waste, either through source reduction, reuse, recycling or composting.

If source reduction and reuse options don't exist, then recycling and composting should be implemented and are preferable to disposal.

This section provides more specific guidance on materials and products that contribute to solid waste. If choosing this asset for a resource conservation plan, the primary focus is identifying source reduction solutions (i.e., avoiding use or reusing materials to reduce waste created). If no source reduction options exist, then recycling and composting options should be considered.

1. Benefits of Solid Waste Reduction

Reducing materials that end up in solid waste can reduce waste disposal and handling costs, as well as recycling or composting costs. Reducing waste may also help reduce expenditures on raw materials, office supplies, equipment and other materials that the facility purchases. For many facilities, waste reduction is rapidly becoming an important component of their long-term business planning, since it slows the depletion of natural resources, conserves landfill space, and reduces waste management costs. Ensuring more efficient use of resources and reducing waste can make significant contributions to reducing greenhouse gas emissions.

Examples of Resource Conservation for Materials Found in Solid Waste

Reduce Material Use:

- Reducing office paper waste by implementing a formal policy to use double-sided printing and copying, and by making training manuals and personnel information available electronically.
- Improving product design to use fewer materials.
- Redesigning packaging to eliminate excess material while maintaining strength.
- Working with customers and suppliers to design and implement a packaging return program.
- Switching to reusable transport containers.
- Purchasing products in bulk.

Reuse/Donate or Exchange:

- Using incoming packaging materials for outgoing shipments
- Reusing office furniture and supplies, such as interoffice envelopes and file folders.
- Donating unwanted supplies or building materials to local schools or nonprofit organizations
- Reusing industrial scrap

(NOTE: after detailed planning has been conducted, if source reduction and reuse options do not exist, then recycling and composting, which are preferable to disposal, should be considered. Recycling and composting can also be considered in addition to source reduction options, but your planning should focus on source reduction options.)

2. Planning for Solid Waste Reduction

Typical Facility Operations

- Production lines
- Offices
- Stock rooms
- Printer, copier or fax machines/rooms
- Employee lounge, kitchen, lunchroom or cafeteria
- Dock and/or shipping/receiving areas

The first step in planning for solid waste reduction involves reviewing the entire facility's waste streams (not only the TURA production units) and analyzing all collected information to identify the best opportunities for waste reduction.

Facilities then select specific operations on which to focus for detailed evaluation of waste reduction options, and then decide which options to implement. Once operations are chosen, detailed planning would follow the waste up-stream to identify potential resource conservation options and projects to implement.

Either facility staff or consultants may be used to develop the plan. See *Resources for Reducing Solid Waste* (p. 39) for many online resources and other resources that may assist you.

a) 1. Sample Plan Scope for Solid Waste Reduction

The following is an example of a waste reduction plan scope using a fictional facility. Please refer to Section II B (p. 10) of this guidance for more information in developing a plan scope.

Sample Scope of Plan for Materials That Contribute To Solid Waste

Natural Asset Selected as the Focus of the Resource Conservation Plan
The facility selected materials that contribute to solid waste as the natural asset for its resource conservation plan because it had already begun some initial planning in that area, and anticipated significant opportunities for savings.

Summary of the Facility's Use of the Selected Natural Asset
The facility disposes of about 2,900 tons of trash per year and recycles about 160 tons per year. The recycling is primarily metal (80 tons) and cardboard (60 tons). The facility spends an estimated $55,000 per year on trash hauling and disposal costs. The facility disposes significant amounts of paper (from office and administrative operations); organics (from the facility cafeteria); and cardboard (from multiple facility operations). The facility also disposes large amounts of rubber from its manufacturing process and wood packaging crates from shipping operations.

Identify and Rank Opportunities for Resource Conservation of the Selected Natural Asset:
The facility identified the following potential resource conservation opportunities, ranked in the following order:

1. rubber from the manufacturing process – 500 tons disposed/year
2. wood crating from shipping operations – 480 tons disposed/year
3. paper from office and administrative operations – 350 tons additional recycling potential/year

Sample Scope of Plan for Materials That Contribute To Solid Waste
4. organics from the facility cafeteria – 180 tons additional recycling potential/year 5. cardboard from multiple facility operations – 80 tons additional recycling potential/year 6. plastic from cafeteria and shipping operations – 50 tons additional recycling potential/year Rubber and wood crating provide the greatest opportunities for source reduction and are therefore prioritized over paper, organics, and cardboard, for which there are increased recycling opportunities. <u>Description of Operations Selected for more Detailed Evaluation</u> The facility decided to focus on the following facility operations for more detailed evaluation: • Rubber disposed of from the manufacturing line • Wood disposed of from product packaging and shipping • Paper from office and administrative functions • Food waste from the facility cafeteria • Cardboard from shipping operations <u>Procedures for Identifying Resource Conservation Techniques</u> The facility reviewed records from solid waste and recycling contracting, reviewed national waste composition data from similar facilities, reviewed purchasing records, and met with facility staff to determine the amounts of materials found in solid waste and amounts recycled, the facility operations to focus on, and options for reducing the amount of materials found in solid waste. <u>Description of the Resource Conservation Technologies, Procedures, or Training Programs Identified and those Selected for Implementation:</u> The facility selected three options to implement: • Pilot manufacturing process change to dry rubber shavings and reintroduce into the manufacturing process. This pilot will evaluate effects on product quality. This change can potentially reduce amounts of scrap rubber by 50%, saving $20,000 in disposal costs and $200,000 in materials purchasing costs. • Switch from wood crates to reusable packaging transport containers. Although the new packaging cost $30,000 in up-front costs, it will save $35,000 per year in disposal costs. • Revise solid waste and recycling contracts to expand recycling services for paper, cardboard, and other materials, and share value of recycled materials with recycling contractor. The facility will train staff on new recycling procedures and how to properly collect and separate recyclables within the facility. The facility's goal is to increase paper and cardboard recycling by 275 tons, which will capture $1,500 in revenue and save $26,500 in disposal and hauling costs. <u>Other Options Not Selected</u> The facility chose not to implement an on-site food waste composting option. The capital costs of the technology identified were too expensive, given the projected savings. The facility will continue to try to identify technologies with lower capital costs that could provide a shorter payback period.

Typical Charges or Revenue on Waste Bills:
- ***rental, collection and hauling fees***
- ***disposal/ recycling facility charges (usually referred to as a "Tipping Fee");***
- ***if recycling, type of materials recycled and possible revenue from the recycled material.***

b) <u>Characterize Facility-Wide Waste Streams</u>

A facility next conducts some type of waste assessment (also known as a waste audit), which would include looking in dumpsters or bins, reviewing billing and contract information, and determining how much, and the cost, of what types of materials are thrown away or recycled

each day/week. Assessments provide the information necessary to identify operations for detailed planning. Your business can do the assessment or contact a consultant to assist you.

The following are some suggested steps to conduct an assessment:

1. *Gather all waste management billing from the last year or two.* Different departments may manage their own waste streams. It is not unusual to have more than one service provider manage different waste and recycling streams. Typical waste management options include disposal, recycling, composting, donations/reuse, and rendering. Read the bills to find out what you are paying for. Billing can vary dramatically – and often businesses are not clear about what they are actually paying for. Many waste management contracts "bundle" the services into one fee, making it difficult to itemize the costs. You may want to contact your waste management service provider to clarify all charges on the bill (see sidebar).

2. *Review your contracts.* Do you have contracts with your waste or recycling service providers? If so, what do the contracts include and over what time period? Do they match what you are actually paying for?

3. *Identify the location and general contents of all disposal or recycling containers, their sizes, and who services the container, in order to determine what makes up your waste stream:* It is recommended that you walk through the facility to identify the location of trash/recycling containers, and determine their typical contents. The walk-through should include a visit to every department, and the final waste disposal area (where your trash dumpster or recycling containers are located, or where your waste management service provider removes it from your business).

4. *Identify container sizes and type* (contact your trash or recycling service provider if it is not clear). Estimate the percentage and types of materials. Determine the use of the material, if possible, when looking in the disposal or recycling containers. Is it used for industrial or manufacturing purposes, shipping, in the office, or the cafeteria? A quick look in the containers and talking with employees can determine this. If you want to accurately "dissect" your waste stream, consider sorting your trash over a period of time. You will need to convert volume to weight. It may be helpful to keep all your information in a tracking sheet – see box for suggestions on tracking information. There are many online tools that can assist you. See *Resources for Reducing Solid Waste* below for suggested online waste audit tools.

Waste stream analysis may also provide valuable information to clarify appropriate service levels for trash and recycling and other waste reduction opportunities

Typical Information Found in a Tracking Spreadsheet

- Location of container
- Final disposition (disposal, recycling, etc…)
- Size of container
- Frequency of pick-up
- Whether the load is full or not
- Cost of service
- Service provider

5. *Compare your billing and contract information to actual service levels.* Does what you are paying for match your current service levels? If not, you may want to clarify this with your waste or recycling service provider, and update.

c) Identify Waste Reduction Opportunities and Select Operations for Detailed Evaluation

Reducing waste at the source results in less waste to manage downstream. Analyzing waste streams and working "upstream" will allow you to identify which operations are using which materials. Remember to examine waste outside of the manufacturing process as well. Rank the operations that generate waste streams that provide the best reduction opportunities.

d) Detailed Evaluation of Specific Operations

After a facility has ranked opportunities for resource conservation and selected specific operations, it then identifies and evaluates specific waste reduction options within each selected operation (e.g., redesigning products to use less material). By following waste "up-stream," you can identify how much material your facility purchases. This includes developing a process flow diagram that shows the movement of the material through the operations. There are many ways to reduce waste, whether by changes in materials ordering, specifications, or production practices to produce less waste, reusing materials in-house, such as using scraps as inputs to the same process from which they came; or using the material in other processes or for other uses in the facility.

Options could include working with suppliers (i.e., supply chain management) to reduce materials purchased and packaging used, or working with material-specific national trade associations to identify resource conservation opportunities, or instituting performance-based contracts with service providers that could assist you in identifying and reducing waste. You may be surprised to find that some of the easiest, most cost-effective, and most widely used waste reduction techniques are simple improvements in housekeeping (e.g., reduced materials ordering).

Source reduction options are to be considered first. If no source reduction opportunity exists, then recycling and composting options should be considered.

Complete a technical and economic evaluation to determine the feasibility, savings and costs of implementing each identified conservation option. Some of the research may have been done in previous steps. There is no prescribed method for how to complete this analysis; however, it needs to be thorough enough to enable your facility to make educated decisions about whether or not to implement each option. If using contractors, consult with them before they begin to determine if they will perform this analysis. Goals for reduction and an implementation schedule must be included in the plan for any options the facility chooses to implement.

3. Resources for Reducing Solid Waste

MassDEP has extensive information and assistance on solid waste management at: http://www.mass.gov/eea/agencies/massdep/recycle/.

RecyclingWorks in Massachusetts: RecyclingWorks in Massachusetts (RecyclingWorks) is a technical assistance program that is fully funded by MassDEP and administered under contract to MassDEP by the Center for EcoTechnology. The RecyclingWorks program includes a web site with guidance and resources on waste reduction, reuse, recycling, and composting, including a searchable service provider database, case studies and guidance, and news and events listings. RecyclingWorks also includes a phone hotline (888)254-5525 and an email address – info@recyclingworksma.us – for businesses to contact with questions. RecyclingWorks even provides direct on-site technical assistance when needed. The RecyclingWorks program also holds regular forums which provide opportunities for education and networking. To learn more, visit www.recyclingworksma.com.

The Massachusetts Operational Services Division's Environmentally Preferable Products Procurement Program has rigorous environmental procurement standards and recommends environmentally preferable products. Although businesses cannot purchase from the state's contracts, they may review the guidance and standards set by the Commonwealth. The website includes case studies and reports: http://www.mass.gov/anf/budget-taxes-and-procurement/procurement-info-and-res/procurement-prog-and-serv/epp-procurement-prog/.

Federal Programs: The US EPA has developed a number of online tools and guidance for business waste reduction that can be found on the EPA New England's website at: http://www.epa.gov/managing-and-transforming-waste-streams-tool-communities. Another information resource includes the EPA's Pollution Prevention webpage with upstream resources for reducing materials found in solid waste, such as environmentally preferable purchasing, waste minimization, and Design for the Environment: www.epa.gov/p2.

D. TOXIC SUBSTANCE USED BELOW REPORTING THRESHOLDS AND CHEMICAL SUBSTANCES EXEMPT FROM TURA REPORTING

For purposes of this guidance, these two assets have been combined and broken down into two categories based on the the planning processes suitable for each.[3]:

Resource Conservation Planning for Toxics and Non-Listed Chemical Substances closely follows TUR planning, except that it focuses on chemicals not already subject to TUR reporting and planning.

1. *Toxic substances from TURA reporting:* This category includes the use of TURA listed chemical below reporting threshold or in exempt operations such as research and development and the use of non-TURA listed chemical substances. This chemical use is grouped together because the planning process typically follows TUR Planning.

2. *Toxic substances used in articles or products.* This category includes chemical use in products that the facility purchases, such as janitorial products and pesticides, rather than direct use of the chemical at the facility. These chemicals are presented separately because they require a different planning process that focuses more on up-stream supply chain management.

1. Toxic Substances Exempt From TURA Reporting

There are 1,416 TURA listed chemicals or chemical categories, and thousands of other chemicals that are not listed that may exhibit toxic and/or hazardous properties. Many countries have begun implementing laws to limit hazardous chemicals from being used, such as the European Unions' Restriction of Hazardous Substances in Electrical and Electronic Equipment (EU's RhoS Directive) and the EU's Registration, Evaluation, Authorization and Restriction of Chemical Substances (REACH). While TUR planning addresses many chemicals used in Massachusetts, there are many chemicals not covered by TUR planning.

One option for a facility is to identify toxic substances that it uses in its processes that are not currently subject to TURA reporting and toxics use reduction planning as an asset for resource conservation planning. This asset includes:

- TURA-listed chemicals used below reporting thresholds
- TURA-listed chemicals in processes or operations that are not required to report or plan under TURA (e.g., research and development and pilot equipment).
- Non-TURA listed chemicals (chemicals that are not listed under 301 CMR 41.00) that have emerging hazard information (e.g., brominated flame retardants) or are of low hazard but have significant opportunities for source reduction.

---

[3] This section refers to the last two assets listed on page 3 of this guidance document: (4) Toxic Substances used below threshold amounts and (5) Chemical substances exempt from TURA reporting. For purposes of the guidance and the planning process, these two assets are grouped differently than they are in the regulations (see 310 CMR 50.92 (2).)

a) Benefits of Reducing Toxic Substances Exempt from Reporting

Reducing or eliminating toxic and hazardous substances reduces the risk of exposure for facility employees, suppliers, customers and the environment. It can also increase efficiency, improve competitiveness, and reduce or eliminate chemicals on customers' restricted substances lists. This is an opportunity to use the TUR planning framework to reduce toxics that are not reported under TURA or exempt from reporting, but where there may be significant TUR opportunities. Facilities can identify chemicals of concern, chemicals with emerging hazard information, or are of low hazard but have significant opportunities for source reduction.

b) Planning for Toxic Use Reduction

The first step in planning for toxics use reduction is to conduct a broad review of facility-wide use of either TURA chemicals used that fall below reporting thresholds, TURA chemicals that are exempt from reporting, or non-TURA listed chemicals. Facilities are required to track this information for TURA listed chemicals. Other chemical use may be identified through different departments or tracked through the purchasing division.

Once a facility has identified chemicals, consider whether each chemical has significant opportunities for toxics use reduction, is used in large quantities, or potentially presents significant risks. A facility may want to check with its customers to find out if they have a list of restricted toxic or hazardous substances, or are considering adopting one. In the resource conservation plan, the plan summarizes the uses of the chemicals considered, the specific operations in which the chemicals are used, and an explanation of why the chemicals and the operations were chosen as the focus of the plan.

The facility then follows the TUR planning process for the chosen chemical or chemicals and facility operations.

c) Sample Plan Scope for Toxic Chemicals Exempt from TUR Reporting

This plan scope serves as a summary of the plan (please refer to Section II B (p. 9) of this guidance for more information on developing a plan scope). The example below illustrates a sample scope where a non TURA-listed chemical is the asset chosen for the resource conservation plan.

Sample Plan Scope for a Non TURA-Listed Chemical
This includes: o *800 gal/year of D_5 at $20.00/gallon = $16,000/year* o *Waste cost- $8,000/year* o *Labor = $30,000/year* o *Maintenance = $6,000/year* o *Utility = $8,000/year* o ***800 gal x 8 lb/gallon = 6,400 lb/year***

Sample Plan Scope for a Non TURA-Listed Chemical

- Thirteen other non-TURA solvents were used in aerosol cleaners by the maintenance department to clean various dirty, oily parts (as regular maintenance) and production equipment, at a purchasing cost of $4,500/year.

Facility-wide scope of Non-TURA listed solvents used:

- *D_5 – 6,400 lbs/year*
- *Aerosols - terpenes, esters and hydrocarbons – 2,200 lbs/year*

Identify and Rank Opportunities for Resource Conservation of the Selected Natural Asset:
The facility identified the following potential resource conservation opportunities, ranked in the following order:

1. The use of D_5 solvent in the degreasing system could be eliminated by substituting a less hazardous or toxic alternative, or by identifying a different degreasing system. The volume and cost of the D_5 used is high, and the potential health effects of the solvent are of increasing concern. Additionally, employees have complained about the strong odor of this degreaser, and requested a replacement.

2. The use of multiple, high VOC, high odor aerosols for maintenance. There are opportunities to identify non-toxic or less toxic alternatives, or to change operating practices to reduce the use of the solvents. Further research is needed on whether there is a need for so many different solvents.

Procedures for Identifying Options and Resource Conservation Techniques
The facility manager reviewed the facility's purchasing and hazardous waste disposal records, potential replacement cleaners, and similar facilities' cleaning methods, and met with staff to determine suitability to their operation. Maintenance personnel were consulted in gathering specific technical criteria and shop floor input for maintenance aerosols.

Description of Operations Selected for more Detailed Evaluation
The facility decided to focus their detailed evaluation on eliminating D_5 use in the vacuum vapor degreasing operation.

Description of the Resource Conservation Technologies, Procedures, or Training Programs Identified and Option(s) Selected for Implementation:

Option Selected: The facility selected to implement the ultrasonic cleaning with an estimated cost savings of $57,000/year and a reduction of 6,400 lbs/year in the use of D_5. Installation cost is estimated at $180,000, which includes the ultrasonic equipment filter and skimmer, aqueous cleaner with corrosion inhibitor and rinse tanks. The annual operating cost estimate includes $13,000/year:

- Chemicals = $2,100/year ($175.00/month which includes chemical purchases and waste disposal)
- Water = $2,700/year
- Electricity = $8,200/year.
- Training will be done in-house at no additional cost.
- Drying time will be increased, but will be offset by the increased capacity.

Sample Plan Scope for a Non TURA-Listed Chemical
The aqueous cleaner is an alkaline (Ph=10), with 1-5% 2-dimethylamino ethanol (108-01-0) and would increase water use. *Options Not Selected:* Two HFC (hydrofluorocarbon) products and one VMS (volatile methyl siloxane) product were considered for use in a new vapor degreasing system. The HFC options were rejected due to concerns over global warming potential, and the other VMS had insufficient environmental health and safety data. These options were also more costly over their life cycle than the chosen aqueous system.

2. Toxic Substances Used in Articles and Products

TURA currently exempts toxics in articles and in certain products used at a facility from TURA reporting and planning requirements. This category of chemical substances includes chemicals used in products that the facility purchases, rather than direct use of the chemical at the facility. These chemicals require a different planning process that focuses more on up-stream supply chain management.

The scope of "toxics in articles and products" includes any article and product used in the facility – not only the manufacturing

There is growing consumer concern about toxics in articles and products. Resource conservation planning for non-listed chemical substances allows facilities to focus on reducing toxics in the following areas:

- Toxics present in articles and products used at the facility (e.g., products used for janitorial and facility grounds maintenance, pesticides).
- Toxics in articles used by the facility in its manufacturing processes (e.g., mercury in lamps, lead in batteries).

Because there are many combinations of articles that contain toxic chemicals, this guidance covers how to conduct an assessment in order to identify a chemical that may be used in multiple products for further analysis, or a specific category of products that contains known chemicals of concern. The guidance uses the terms "articles" and "products" interchangeably.

Resource Conservation Planning for Chemicals Used in Articles and Products requires working upstream on supply management issues.

Examples of Toxics in Articles

- Lead and other metals in batteries being used at the facility.
- Mercury in switches, where the switch is purchased from another vendor and included in the product at the facility.
- Metal arms for chairs containing lead that are purchased and attached to chairs at the facility.

a) Benefits of Reducing Chemicals Used in Articles and Products

Reducing or eliminating toxics and other chemicals in articles and products reduces the risk of exposure for facility employees, suppliers, customers and the environment. It can also increase efficiency, improve competitiveness, and reduce or eliminate chemicals on

customers' restricted substances lists.

b) Planning for Chemicals Used in Articles and Products

Conduct a general assessment to identify opportunities for resource conservation at your facility. This could begin with a brainstorming session with your TURA team, or preliminary research into potential resource conservation opportunities. The facility-wide assessment broadly identifies uses of toxics in articles and gathers enough information to select for detailed evaluation substances with known, significant uses of toxics in articles (e.g., mercury), or of a specific product category with known toxics (e.g., batteries used in office equipment and process equipment). You then would identify specific operations that use the chemical, and evaluate options for reducing toxics use.

c) Sample Plan Scope for Toxics in Articles and Products

The following is an example of a plan scope for toxics in articles using a fictional facility. Please refer to Section II B of this guidance for more information on developing a plan scope.

Sample Plan Scope for Toxics Use Reduction in Articles

Natural Asset Selected as the Focus of the Resource Conservation Plan
The facility selected toxics in articles for its resource conservation plan.

Summary of the Facility's Use of the Selected Natural Asset
The facility reviewed purchasing lists to identify potential toxics in articles that are used in the facility. The facility identified mercury because it had already begun some initial planning in electricity conservation, and was considering replacing its existing fluorescent lamps with T5 fluorescent lamps that use 75% less energy than the original lamps, and contain about 80% less mercury. The facility disposes of 2,080 pounds of mercury-containing items each year as part of its normal maintenance of their production and facility equipment. The facility is a 250,000 square foot building built in the 1960s, and uses 313, 4-lamp fluorescent fixtures to light the operations. There are also 10 thermostats with mercury and 80 mercury switches throughout the facility.

Facility-wide scope: all articles/products containing mercury

- *313 fluorescent lamps x 4 lamp fixture x ~50 mg Hg/lamp= 62.6 grams of Hg*
- *80 industrial switches x estimate ~3.5 grams Hg/switch = 280 grams of Hg10 thermostats x 3 grams Hg/thermostat = 30 grams of Hg*
- Total Mercury in Facility: 372.6 grams of Hg

Identify and Rank Opportunities for Resource Conservation of the Selected Natural Asset:
The facility identified the following potential resource conservation opportunities, ranked in the following order:

1. Fluorescent lamps:
   - Replace lamps purchased/yr with low mercury lamps (4 mg Hg/lamp), which are also more energy efficient: high priority
2. Mercury thermostats:
   - Replace thermostats with electronic thermostats: building HVAC thermostats already proven feasible, high priority
3. Mercury switches:

Sample Plan Scope for Toxics Use Reduction in Articles
o Replace switches with non- mercury switches, feasibility will depend on individual equipment requirements: need further assessment, medium priority Procedures for Identifying Options and Resource Conservation Techniques The facility manager reviewed the facility's purchasing and hazardous waste disposal records, reviewed potential replacement articles, and met with staff to develop an inventory of mercury-containing items. The switch inventory is categorized into different groups based on function (e.g., float, temperature, tilt, etc.). Equipment vendors were consulted for information on non-mercury alternatives. Description of Operations Selected for More Detailed Evaluation The facility decided to focus on the following facility operations for more detailed evaluation: • Lighting with fluorescent lamps • Mercury-containing float switches • Mercury-containing thermostats Description of the Resource Conservation Technologies, Procedures, or Training Programs Identified and those Selected for Implementation: *Options Selected:* • Replacing 1960 vintage lighting with T5 fluorescents that contain about ¼ the mercury and use fewer fixtures to light the same amount of space. This project will have an estimated $65,000 annual savings, increase lighting in the facility, decrease energy usage, and will reduce the amount of mercury in the facility by approximately 40 grams. Existing bulbs will be recycled; the future accidental release of mercury from broken bulbs will also be reduced. • Float switches will be replaced by various mechanical and optical switches appropriate for the specific applications. • Electronic thermostats will be installed in all office and personnel areas. • Facility purchasing procedures will be modified to include a review of all future equipment purchases, to avoid purchasing mercury containing components, whenever possible. • Facility staff will receive training on mercury-containing devices, available alternatives, proper disposal, as well as maintenance and use of new alternative devices. *Options Not Selected:* • Thermostats in production areas will be considered for replacement following a study planned for next year on the production area HVAC system.

3. General Planning Steps for Development for Toxic Substances Exempt From TURA Reporting And Non-Listed Chemical Substances

a) Characterize Facility-wide Use of Toxics in Articles and Products or Otherwise Exempt from TURA Planning

Start with a general assessment to identify toxics in articles and products used in your facility. Your facility may want to conduct a brainstorming session with your TURA interdisciplinary team and review records (such as facility purchasing records) to identify articles and products that typically contain chemicals of concern and the operations that use them. The purpose of this review is to identify either a known chemical that is used in significant quantities in articles used at the facility *or* known articles used at the facility that typically contain one or more TURA chemicals. The facility is not required to identify all

toxics in articles at the facility, especially since there is an existing TURA exemption for reporting toxics in articles, and the facility may not be currently tracking these materials. However, there must be a good faith effort to identify toxics in articles and assess the operations that use them. Some typical places that you may want to check include:

- Customers' restricted substance lists
- Persistent, bio-accumulative, and toxic chemicals such as lead and mercury and other higher hazard substances
- Existing MSDSs and product specification sheets
- Conversations with your major suppliers

Once the facility has identified either a chemical or product category, the facility would conduct a more complete assessment that would include all of the operations that use the chemical or product category across the entire facility, not only the TURA-listed production units.

Collecting and tracking this information is necessary to establish baseline information and managing the chemical or article use. The facility also identifies how much of the known toxic is in the article – on a per unit basis - so that you are able to estimate the amount of the chemical used at the facility. A list of possible articles or type of toxic substances will need to be included in the plan. Once the assessment is finished, the facility would summarize and characterize the use of chemicals assessed across all articles or products considered.

b) Identify Toxics Use Reduction Opportunities and Select Operations for Detailed Evaluation

The next step is to analyze the facility-wide assessment results and select specific operations for detailed planning. The following provides examples for both cases:

- The facility chose mercury as the chemical to focus on. It would then identify all of the operations in which mercury is used in the facility. One operation could be mercury in switches in production equipment. Detailed evaluation would review options for reductions or removal of mercury in switches.
- The facility chose batteries as the article containing chemicals. It would then identify all of the batteries used in the facility and determine which ones had chemicals of concern. One operation could be batteries containing lead and cadmium and used in generators. Detailed planning would review options for reductions or elimination of the identified chemical in the batteries.

c) Detailed Evaluation of Specific Operations

The facility may have completed some detailed evaluation in assessing overall opportunities for resource conservation. Once one or more toxic chemicals in an article or product category and relative operations have been chosen, the next step is to evaluate specific options. You will likely need to work closely with your purchasing department and supply

chain to identify, evaluate, and implement options (e.g., reviewing and evaluating existing supplier contracts and/or management standards for existing specifications, preferences or prohibitions that result in reduced toxics in these articles). Options could include:

- Replacing the article with another article that does not contain toxic chemicals or constituents.
- Replacing the article with another article that contains a less toxic chemical.
- Eliminating or reducing the use of the article.

In the case of toxics in articles, the process flow diagram is different than in typical TUR planning in that it identifies the amount of each toxic used, in what articles, products, and operations the toxic is used, and in what amounts, and how and where those products are used at the facility.

4. Resources for Toxic Substances Exempt From TURA Reporting and Non-Listed Chemical Substances

TURI and OTA have a wealth of existing TUR planning resources that are applicable to planning for this asset area. In addition, TURI maintains information on emerging contaminants of concern and contaminants that are restricted by major companies on TURI's website (www.turi.org). You will also find at this website information and referrals to the US EPA's Design for the Environment and Environmentally Preferable Purchasing (EPP) programs, and Northeast Waste Management Officials Association's (NEWMOA) Mercury Reduction Program. These programs provide information about the presence of toxics in articles as well as information about safer alternatives. Also, the Massachusetts Operational Services Division's EPP Program has a wealth of information about the benefits of EPPs, guides, and tools

IV. APPENDICES

APPENDIX A - RESOURCE CONSERVATION PLAN SUMMARY FORM GUIDANCE

Facilities are required to complete and submit the Plan Summary form to MassDEP by July 1 of the applicable planning year in which they develop a Resource Conservation Plan.
These are the data elements that are required in the Resource Conservation Plan Summary Form:

A. Targeted Asset

_____
Targeted Asset

Indicate the asset that you have selected for resource conservation planning. If you have chosen more than one asset, then you will need to complete a plan summary form for each asset. The assets are:

- Energy
- Water
- Materials that contribute to solid waste
- Toxic substances used below threshold amounts (i.e., TURA-listed chemicals used below reporting thresholds)
- Chemical substances exempt from TURA reporting

B. Selected Operations

List the operations the resource conservation plan covers. If an operation is not listed, choose “other”.

1. Operation Code	2. Operation Code	3. Operation Code	4. Operation Code
5. Operation Code	6. Operation Code	7. Operation Code	8. Operation Code

☐ Other (describe): _____

Indicate the operation codes (provided in pull-down lists) that the resource conservation plan covers. If your particular operation code is not included in the list, then select Other.

The list of operation codes and descriptions is as follows:

1	Air Compressors
2	Air Handlers
5	Boilers
6	Building Cleaning Operations
7	Cafeteria
8	Chillers
9	Computers

10	Dock
11	Domestic Plumbing (restroom consumption such as toilets, urinals, showers, and faucets)
12	Employee Lounge
13	Equipment Maintenance
14	Fan Systems
15	Vehicles and Fleets
16	Furnaces
17	Process Heating and Cooling
18	Building Heating Ventilation and Air Conditioning Systems (HVAC)
19	Kitchen
20	Kitchen Plumbing (ice machines, food preparation, dishwashers, etc.)
21	Landscape Irrigation
22	Landscaping
23	Laundries
24	Lighting
25	Lunchroom
26	Motors
27	Office
28	Ovens
29	Pool
30	Printer, copier or fax machines/rooms
31	Process Heaters
32	Process Water (process cooling, rinsing operations, chemical dilution, waste pre-treatment)
33	Production line
34	Pumps
35	Research and development
36	Shipping/receiving areas
37	Spa
38	Stock rooms
39	Other

C. Baseline Amount of Asset Used

This includes the total amount of the asset used during the baseline calendar year, reported as a total amount.

_____	_____	_____
Year	Total Amount of Asset Used	Unit of Measure (Pull down list)

This section includes:

- The baseline year (for example, 2015, the year on which the plan is based)
- The total amount of asset used in the base year
- Units of measure are provided in a pull-down list. You will need to choose a unit of measure for the asset you have chosen. [not sure what this means]

The pull-down list of units of measure for each particular asset includes:

- Energy – MMBTU's per Year
- Water - Gallons per Year
- Solid Waste - Pounds per Year
- Toxics Below Threshold - Pounds per Year
- Chemicals Exempt - Pounds per Year

Common Conversions:

1 KwH	equals	3412 BTUs
1 BTU	equals	1,055.06 joules
1 Therm of natural gas	equals	10,000 BTU's
1 Ton (short)	equals	2,000 pounds
1 Therm	equals	100,000 BTU's
1 MBTU	equals	1,000 BTU's
1 MMBTU's	equals	1,000,000 BTU's
1 kWh	equals	1,000 watt hours
1 Mega Watt Hour	equals	1,000 kWh
1 CCF (hundred cubic foot)	equals	748 gallons

D. Options Selected to Implement

List and describe the resource conservation options chosen to be implemented.

E. Other Options Considered

List the resource conservation options you considered but decided not to implement. You also may provide an explanation of why you chose not to implement a particular option.

List and describe other resource conservation options that you considered but decided not to implement. This may include an explanation of why you chose not to implement these other options.

F. Goals for Reducing the Asset

List the resource conservation goal(s) as a percentage reduction or a specific amount reduction over a certain time period in the unit of measure (as indicated in Section B) and the expected change. The first line is an example.

Amount of Reduction	Unit of Measure	Goal by date (Year)	Description of Goal
Example: 15%	Gallons	2011	Reduction of potable water use and sewer discharge
F.1.a	F.1.b	F.1.c	F.1.d
F.2.a	F.2.b	F.2.c	F.2.d
F.3.a	F.3.b	F.3.c	F.3.d
F.4.a	F.4.b	F.4.c	F.4.d

This section is a list of the resource conservation goals for reducing the asset use. The goals for reduction should be indicated as a percentage and/or a specific amount of expected reduction by a future year. (For example, if your baseline year is 2009, then your goal year may be 2011.) A brief description of each goal is also included. These goals may be the same as the expected change listed in Section G, or they may be different. For example, your facility may set a 5 or 10 year goal for reducing use of the asset that goes beyond the two-year planning period.

G. Expected Change in the Amount of Asset Used

Indicate the expected change in the amount of the asset(s) to be used (due to the options implemented) between the year on which the plan is based and two years after the plan is due.

The unit of measure in this section is _____ (as listed in Section B).
(Pull down list)

Note: You will report actual changes in the amount of the asset used on a resource conservation progress report that you must submit with the next toxics use reduction plan summary. However, if there are actual changes to report due to an option already implemented, you may include them in Section H below.

Expected Annual Change: _____

This section includes the expected annual change in the amount of asset used (due to the operations implemented) per year. This change in asset use should be the change due to the options implemented rather than change in facility wide use due to other factors.

You should indicate the same unit of measure from the pull down list as you indicated in Section C.

H. Additional Information

You may provide additional information about your resource conservation plan.

You may include any additional information about your facility's resource conservation plan that you would like to report to MassDEP.

APPENDIX B - RESOURCE CONSERVATION PROGRESS REPORT FORM GUIDANCE

Facilities are required to complete and submit this form to MassDEP by July 1 of the next planning year after they developed a Resource Conservation Plan. For example, if a facility completed a Resource Conservation Plan in 2016, then the facility would be required to submit a Resource Conservation Progress Report by July 1, 2018. The data elements included on the Progress Report are described below

A. Targeted Asset

_____

(Pull down list)

This is the asset that you selected in your resource conservation plan. This is the asset that you selected in Section A of your Resource Conservation Plan Summary Form. The pull-down list of assets is:

- Energy
- Water
- Materials that contribute to solid waste
- Toxic substances used below threshold amounts
- Chemical substances exempt from TURA reporting

B. Identification Information

1. Year Resource Conservation Plan was completed: _____
2. Progress Report Date: _____

1. The year the Resource Conservation Plan was completed is the previous planning year (2 years prior to current planning year).
2. The Progress Report Date is the current date that you will be submitting the Resource Conservation Progress Report.

C. Resource Conservation Progress

BASELINE INFORMATION
(From Section C, RC Plan Summary)

a. Year: _____ b. Amount used per year: _____ c. Unit of Measure: _____
(Pull down list)

a. The baseline year is from Section C of your Resource Conservation Plan Summary form.
b. The total amount of asset used per year. This is the baseline amount used, from Section C of your Resource Conservation Plan Summary form.
c. The unit of measure (provided in a pull-down list). It is the same unit of measure that you selected in Section C of your Resource Conservation Plan Summary form.

The pull-down list of units of measure is:

- MMBTU - Energy
- Gallons - Water
- Pounds – Solid Waste or Toxics

REDUCTION GOAL
(From Sections F and G, RC Plan Summary)

d. Year to be Achieved: _____ e. Expected Annual Reduction: _____ f. Actual Annual Reduction: _____

g. Description: _____

d. The year to be achieved is from Section F of the Resource Conservation Plan Summary Form, in the Goal by date (Year) column.
e. The expected annual reduction is from Section G of the Resource Conservation Plan Summary Form.
f. The actual annual reduction is the actual amount of the asset that your facility reduced per year.
g. The description is from Section F of the RC Plan Summary Form, Description of Goal.

* The form will allow you to enter more than one Goal from Section F of the Resource Conservation Plan Summary Form.

D. Options Implementation Status

Provide implementation status for each selected option listed in Section D of the Resource Conservation Plan Summary Form.

List the options selected to implement from Section D of your Resource Conservation Plan Summary, and provide implementation status for each option. In addition, if any option listed in Section D of the Resource Conservation Plan Summary form was not implemented, state the reason it was not implemented.

If you wish to select another asset, then select “Add Asset”
.

APPENDIX C - RESOURCE CONSERVATION PLAN SUMMARY CERTIFICATION STATEMENTS

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention – Toxics Use Reduction Report

Resource Conservation Plan Summary

Please refer to the Resource Conservation Guidance when filling out this form.

2011
Planning Year

Facility Name

MassDEP Facility ID Number

Certification Statements

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A. Based on my independent professional judgment as a MassDEP Certified TUR Planner, and MassDEP Certified Resource Conservation Planner, I Certify under penalty of law that the following is true:

(a) I have examined and am familiar with this Resource Conservation Plan; and

(b) the Plan satisfies the requirements of 310 CMR 50.90; and

(c) the Plan demonstrates a good faith and reasonable effort to identify and evaluate resource conservation options.

1. Signature of TUR Planner approved to certify Resource Conservation Plans

2. Date (mm/dd/yyyy)

3. Print Name of TUR Planner approved to certify Resource Conservation Plans

4. Print Title of Toxics Use Reduction Planner

5. Email Address

6. TUR Planner ID Number

B. I certify under penalty of law that the following is true:

(a) I have personally examined and am familiar with this Resource Conservation Plan;

(b) I am satisfied that any supporting documentation used in the development of the Plan exists and is consistent with the Plan;

(c) based on my inquiry of those individuals immediately responsible for the development of this Plan, I believe that the information in the Plan and any supporting documentation used in the development of the Plan is true, accurate, and complete;

(d) the Plan, to the best of my knowledge and belief, meets the requirements of 310 CMR 50.90; and

(e) I am aware that there are penalties for submitting false information, including possible fines and imprisonment.

1. Signature of Senior Management Official

2. Date (mm/dd/yyyy)

3. Print Name of Senior Management Official

4. Print Title of Senior Management Official

5. Email Address

RCCERT341

Resource Conservation Certification • Page 1 of 1

TURA Partner Agencies:

MassDEP, Toxics Use Reduction Program
www.mass.gov/dep/toxics/toxicsus.htm

Toxics Use Reduction Institute (TURI)
www.turi.org

Office of Technical Assistance and Technology (OTA)
www.mass.gov/eea/ota

Massachusetts Department of
Environmental Protection
One Winter Street
Boston, MA 02108-4746

Commonwealth of Massachusetts
Charles D. Baker, Governor

Executive Office of Energy and Environmental Affairs
Matthew A. Beaton, Secretary

Department of Environmental Protection
Martin Suuberg, Commissioner