

Department of Resources Recycling & Recovery

SCOPE OF WORK

Used Oil Online Lifecycle Assessment (LCA) Tool

I. INTRODUCTION/OBJECTIVES

As part of Senate Bill (SB) 546 (Lowenthal, Statutes of 2009, Chapter 353), CalRecycle contracted with third party contractors to perform a lifecycle assessment (LCA) and economic analysis of the used oil management system in California. The results of that analysis are being made available to the public via extremely lengthy and highly technical reports. CalRecycle, in its continued efforts to provide information to the public in the most transparent and useful manner possible, has decided to provide this information in a web-accessible application. This will not only allow public access to the very technical information but will also allow CalRecycle to easily update the data, and likewise the analysis, when new data become available.

II. WORK TO BE PERFORMED

The Contractor will convert the data, information, and analysis contained within the Used Oil LCA that was created in response to SB 546, along with material flow analyses and combustion modeling into a format that is able to be accessed and manipulated by the public via a web browser. This system must be capable of being hosted by CalRecycle's existing Information Technology infrastructure.

III. TASKS IDENTIFIED

All written deliverables are subject to the Contract Manager's written approval. Timeline assumes a start date of September 15, 2013.

Task 1. Formalize Model Description

The current model integrates multiple data resources, including economic inputs from the Direct Impacts Model (DIM) produced by ICF International under CalRecycle contract DRR 11040 in accordance with SB 546, material flow measurements based on manifest reports, life cycle inventory (LCI) data, and reports from contractors and the literature to compute LCA results. In order to make the model accessible to a non-expert user, the relationships between these data sources must be made explicit. The parameterization used by the authors must also be reduced in scope in order to meet CalRecycle's objectives. The outcome of this task will be a set of data tables suitable for integration into an external database application, representing material flow data sources, life cycle inventory data sets, life cycle impact characterization factors, and user-configurable parameters.

Task 1a. Distill the GaBi LCI model into a minimal data set.

Define foreground and background processes. Derive matrix representation from process-flow network. Apply parameterization strategy. Ensure protection of confidential data through roll-up procedures.

Deliverables: Life cycle inventory model in matrix form.

Timeline: November 2013

Task 1b. Identify list of material flows

Describe the reference flow in terms of discrete material inputs and outputs. Provide in terms of defining physical characteristics such as density and composition. Define flow data sources and parameters of interest.

Deliverables: Material flow inputs to the LCI model

Timeline: November 2013

Task 1c. Extract impact assessment methodology(ies).

Select life cycle impact categories in consultation with CalRecycle. Extract characterization factors for elementary flows involved in the inventory model.

Deliverables: Tables of characterization factors.

Timeline: November 2013

Task 1d. Generate formal parameter list

Select the list of parameters that will be accessible to users. Provide default values and ranges based on the results of the Used Oil LCA. Generate documentation regarding parameters and ranges.

Deliverables: List of parameters and documentation.

Timeline: Operable parameter list, November 2013. Documentation, March 2014.

Task 2. Develop web implementation (3–6 months, PI 50%, Developer 75-100%)

Develop the computational framework that takes user input parameters through to life cycle impact assessment results. It will apply user-supplied parameter settings to the above parameterized inventory data and compute impact assessment results, which will be delivered to the visualization tool developed in Task 3. The database workflow will be designed to minimize computational complexity for the public-facing tool; internal functionality for CalRecycle staff will be developed as a separate toolset (see Task 4c).

Task 2a. Deploy LCI model to local SQL Server database.

Install and configure SQL server to act as a local surrogate for the CalRecycle server. Develop relational data structure and implement Task 1 in SQL server.

Deliverables: Operable database in SQL server

Timeline: December 2013

Task 2b. Implement Lifecycle Inventory Analysis (LCIA) engine.

Develop software in C# to query SQL server and perform the two computations required to develop LCIA results:

- (i) Compute elementary flows from material flow inputs based on supplied parameterization.
- (ii) Compute impact category indicator scores from elementary flows using extracted characterization factors.

Deliverables: Operable code

Timeline: February 2014

Task 2c. Perform CalRecycle server-side integration.

Transition database and LCIA engine to CalRecycle servers (while coordinating with CalRecycle Information Technology staff); test and debug. Author the web page, including mechanisms to provide user-defined parameters and retrieve flow and LCIA data.

Deliverables: Operable framework on CalRecycle internal website.

Timeline: March 2014

Task 3. Develop user interface (6 months, PI 50-100%, Developer 50-75%)

Determine the manner in which CalRecycle users and the general public interact with the model. The tool is expected to have two main views: a process-flow diagram view showing inputs and activity levels, and a life cycle impact assessment results view showing indicator scores and contribution analysis. Within the process-flow diagram, users will be able to select parameter values to adjust and view their effects on the model. Methods for making comparisons between scenarios will be developed. Note that complexity of the application will be limited by available development time. All subtasks will be conducted in parallel with the goal of producing a public "beta" version in May 2014 and a final version around August-September 2014. Development will occur in collaboration with CalRecycle staff (see Task 4b).

Task 3a. Process-flow diagram

Lay out the used oil reference flow graphically using a Sankey diagram. Develop user-selectable reference case and alternatives / scenarios. Allow users to view process and flow details, access documentation and parameterization.

Deliverables: Operable webpage showing the reference flow.

Timeline: September 2014

Task 3b. Impact categories / results summary view

Report life cycle impact assessment results for the current scenario using bar graphs. Show contribution analysis and/or sensitivity analysis.

Deliverables: Operable webpage showing LCIA results.

Timeline: September 2014

Task 3c. Adjustment of parameters and LCIA Result computation

Allow users to select parameters of interest from either material flows or process inventory characteristics and to adjust bounds for sensitivity analysis. Compute LCIA results using adjusted parameters and present sensitivity results.

Deliverables: Operable webpage for accessing parameters and computing results.

Timeline: September 2014

Task 3d. Scenario development and comparison tools

Allow users to compare distinct scenario-years, defined as complete differentiated parameter sets from a set of pre-defined parameter sets configured by contractors based on scenario analysis in the Used Oil LCA. Allow users to provide their own scenarios. Include historical data from manifest records.

Deliverables: Operable webpage for navigating and comparing scenarios.

Timeline: September 2014

Task 3e. Review and incorporate feedback

Roll out public "beta" version with limited functionality in Spring 2014. Solicit feedback from selected users and incorporate feedback into tool design to the extent that it is practical and consistent with CalRecycle's aims. Using the feedback, create and implement a "final" version with full functionality.

Deliverables: Revisions to tool.

Timeline: September 2014

Task 4. CalRecycle and stakeholder user design (6 months / ongoing, PI 25-50%, Developer 25%)

The model used to generate results for the Used Oil LCA is highly complex and configurable. It is necessary to strike a balance among comprehensiveness, usability, and development time when designing the online tool. Throughout the project, contractors will communicate with CalRecycle to ensure the tool meets the needs of CalRecycle users and stakeholders. Specific features of interest will be developed for inward-facing

and public versions of the tool. This task will be performed in parallel to the tasks described above. The task will involve travel to Sacramento to interface with agency staff.

Task 4a. Tool scope and initial interface design

Select base year cases, sensitivity, and baseline scenario-years to form the core of the tool. Determine major features of interest to CalRecycle. Storyboard user interface workflow. Define inward-facing and public-facing functionality.

Deliverables: Discussion outcomes to inform execution of Task 1.

Timeline: November 2013

Task 4b. Public-facing tool design

Select input parameters available to the public and develop user-modifiable scenarios and parameterizations. Conduct periodic review of live drafts of user interface and workflow by CalRecycle personnel and selected stakeholders. Some desired functions may not be achievable within the current project.

Deliverables: Discussion outcomes to inform execution of Task 3.

Timeline: August 2014

Task 4c. Inward-facing tool design

Establish data maintenance and update needs (inventory data, impact characterization data, material flow data, parameterizations, scenario-years). Design tools to provide required functionality either through a web interface or through external tools (e.g. Access and Excel). Note: certain functions may require advanced computational tools such as a Matlab COM component.

Deliverables: Management tools for inventory data updates and CalRecycle database integration.

Timeline: December 2014

IV. CONTRACT/TASK TIME FRAME

Task	Timeframe	
	Begin	End
1. Formalize Model Description		
1a. Distill the GaBi LCI model into a minimal data set	September 2013	November 2013
1b. Identify list of material flows	September 2013	November 2013
1c. Extract impact assessment methodology(ies).	September 2013	November 2013
1d. Generate formal parameter list	September 2013	March 2014
2. Develop web implementation		
2a. Deploy LCI model to local SQL Server database	November 2013	December 2013
2b. Implement LCIA engine	October 2013	February 2014
2c. CalRecycle server-side integration	January 2014	March 2014
3. Develop user interface		
3a. Process-Flow Diagram	December 2013	September 2014
3b. Impact categories / results summary view	December 2013	September 2014
3c. Adjustment of parameters and LCIA computation	December 2013	September 2014
3d. Scenario development and comparison tools	December 2013	September 2014
3e. Review and incorporate feedback	May 2014	September 2014
4. CalRecycle and stakeholder user design		
4a. Tool scope and initial interface design	September 2013	November 2013
4b. Public-facing tool design	September 2013	August 2014
4c. Inward-facing tool design	September 2013	December 2014