

EverBatt 2023 User's Manual

1. Model structure

1.1. Model Schematic

The schematic of the EverBatt model is shown in Figure 1.

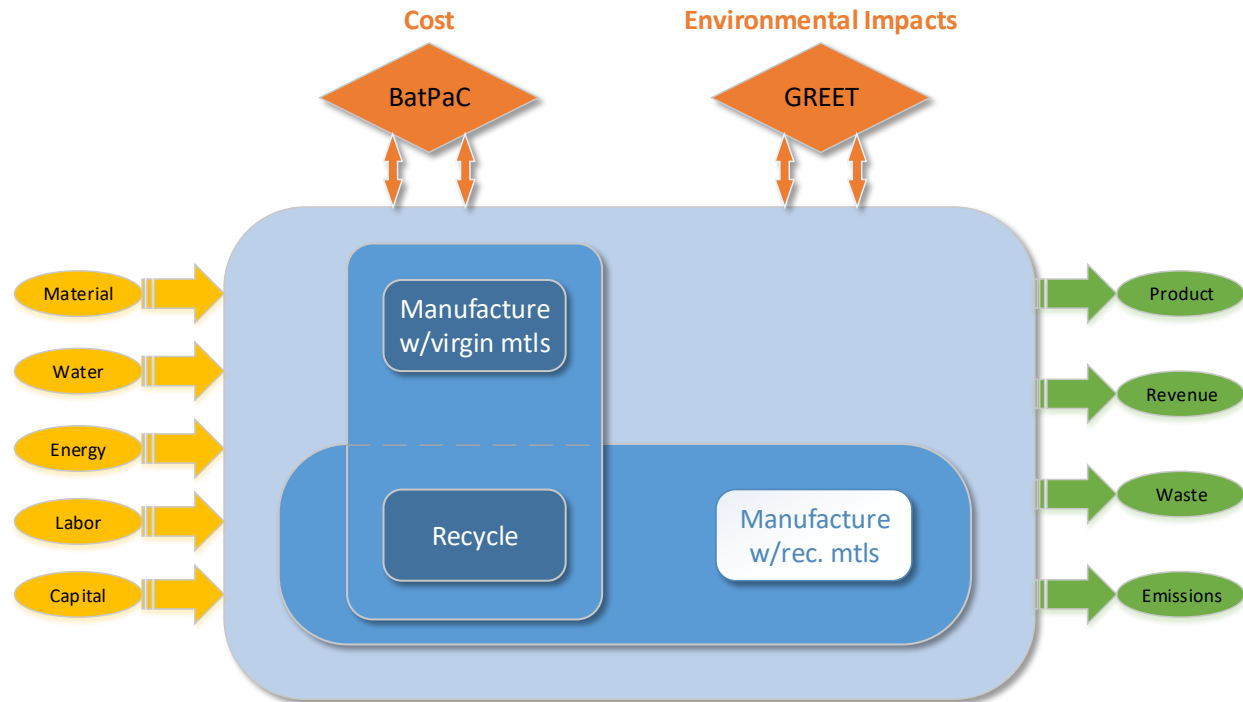


Figure 1. EverBatt Model Schematic

The model consists of three primary modules: battery manufacture with virgin materials, battery recycle, and battery manufacture with recycled materials. Each blue box in Figure 1 represents a level at which you can run the model. For example, you can run the virgin battery manufacture module 1) by itself; 2) together with the recycle module; 3) in combination with both the recycle module and the manufacture with recycled materials module.

The recycle module is comprised of six sub-modules: battery collection and transportation, battery disassembly, battery/manufacturing scrap preprocessing, critical materials recovery via pyrometallurgical/hydrometallurgical/direct technology, material conversion, and cathode production, as shown in Figure 2. Again, you can run the collection and transportation sub-module, the battery disassembly sub-module, or the preprocessing sub-module independently. You can also run them in combination with the rest of the sub-modules. However, the critical materials recovery sub-module requires inputs from the preprocessing sub-module, while the material conversion sub-module requires inputs from both the critical materials recovery sub-module and the cathode production sub-module. Moreover, the cathode manufacture sub-module relies on preprocessing/critical materials recovery throughput to determine its own

throughput, as for cathode production, the default assumption is that it uses up all recovered cobalt material.

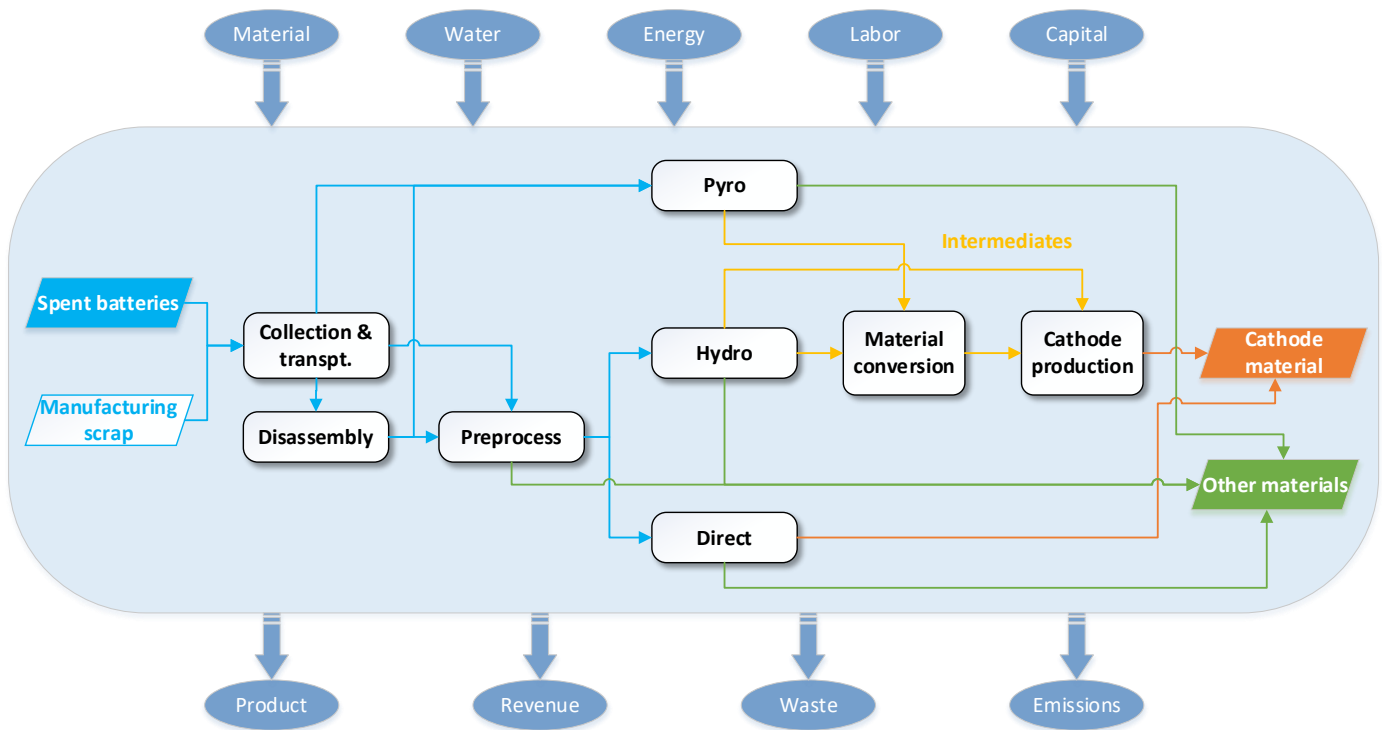


Figure 2. EverBatt Model Recycle Module Schematic

1.2. Model organization

The model is organized into three parts.

- Part I: **red** tabs
 - Input: key input parameters for battery manufacturing, recycling, and manufacturing from recycled materials.
 - Output: key environmental impacts and cost estimates for battery manufacturing, recycling, and manufacturing from recycled materials
 - Report: Scenario comparison and visualizations of user-selected results
- Part II: **yellow** tabs including “Man Par.”, “Col&Trans Par.”, “Disassembly”, “Preproc Par.”, “CM Rec Par.”, “Cath. Prod. Par.”, and “Man Rec Par.”. Each of the tabs contains detailed input parameters (Tables 1.X), as well as calculations of environmental impacts and cost (Tables 2.X), for each of the corresponding stage.
- Part III: **green** tabs including “Mat. Conv Par.”, “Unit Ops”, “Materials”, “Geographic Par.”, “BatPaC IO”, and “GREET IO”. These tabs contain background data for the model. Users are welcome to visit these tabs, but please refrain from making changes in these tabs unless directed to do so, except for the “Materials” tab, which contains unit prices for materials used in all processes.

2. Model format

The color coding of the cells is summarized in Table 1.

Table 1. Legend of Cell Color Coding

Legend	
Content	User inputs
Content	Dropdown lists
Content	Conditioned inputs*. DO NOT CHANGE
Content	Calculation cells. DO NOT CHANGE
Content	Default inputs. DO NOT CHANGE
Content	Populated inputs. DO NOT CHANGE
Content	Placeholder inputs
Content	Warning messages
Content	Hyperlinks.

*To the right of a conditioned input cell are one/a set of default input cell(s) and one user input cell. The user input cell allows you to override the default value. If leaving the user input cell blank, you opt for the default input.

3. How to use the model

- Provide key input parameters for the stage of interest (e.g., Manufacture) in **"Input"**. If you would like to provide detailed information pertaining to that stage, go to step b. Otherwise, go to step c.
- Click on the ["Opt to enter detailed inputs"](#) hyperlink to jump to the **yellow** tab containing detailed input parameters for the stage.
Note that each **yellow** tab is preloaded with default values for all the input parameters. You are encouraged to review the default values, and override them with own data if available.
Also note that the **yellow** tabs can consist of multiple sections. You can use the buttons at the top to maneuver within the tab and among different tabs of the spreadsheet.
- Proceed to the next stage in **"Input"** you would like to evaluate.
- Go to **"Output"** for summary of results, and **"Report"** for scenario comparisons and visualizations.