



Technical LCA Overview for 45Q Applications

Carbon Management Research Project Review Meeting

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U.S. DEPARTMENT OF
ENERGY

Fossil Energy and
Carbon Management



DOE role in the 45Q LCA review process

- DOE provides technical support to the IRS in the form of reviews and consultative guidance based on the LCA requirements in 45Q for carbon oxide utilization
- DOE does **not** make final eligibility determination for 45Q credits – that authority resides with the IRS



Presentation Framing

What will we discuss today

- Technical details and requirements for completing the LCA
- High-level observations from LCA reviews
- NEW NETL data/guidance to streamline process
- NEW routes to getting feedback on pre-commercial LCAs

What we cannot discuss today

- Policy-related matters
- Application-specific items
- Eligibility determinations
- Data that would constitute taxpayer information – e.g., # apps, sectors, concurrences, etc.

45Q LCA Training Workshop

- Hybrid 45Q LCA training workshop held on July 17
- 100+ in-person and 450 virtual attendees
- Focus of workshop:
 - Close gaps that we have identified as part of technical review support for IRS
 - Provide overview of the tools and resources that NETL has developed
 - Review new additions to the NETL toolkit

NETL 45Q LCA Toolkit Enhancements

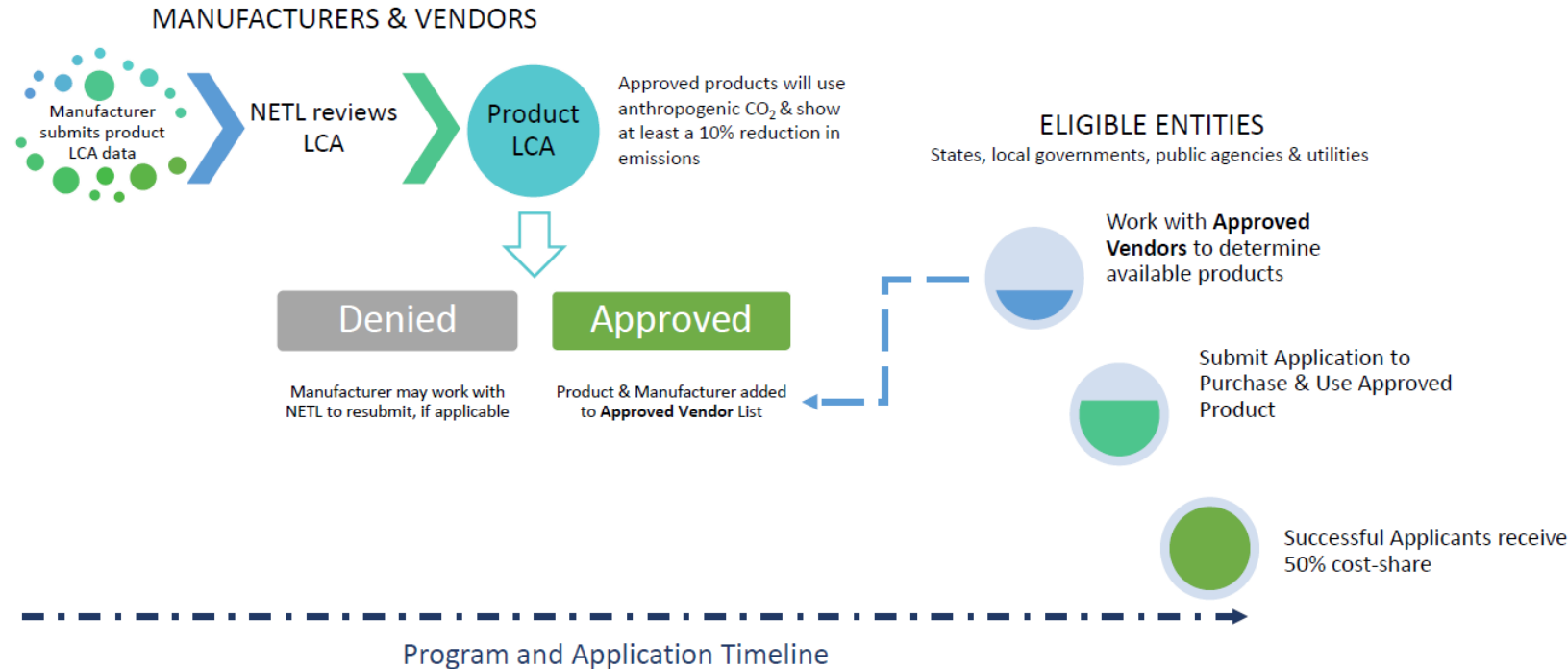
- Standardized comparison product system (CPS) life cycle inventory data for carbon oxide capture from ammonia and ethanol facilities.
- Updated guidance document including clarifications to address frequently asked questions.
- Transparent checklist used by the NETL team to conduct technical reviews of LCA submissions.
- Example LCA reports that are consistent with the NETL guidance.



Supporting CO₂ Products: UPGrants Program

Utilization & Procurement Grants (UPGrants)

- **\$100 million** available to **states, local governments, and public agencies & utilities** to purchase commercial and industrial products that use converted carbon emissions
- Products must demonstrate at least 10% reduction in emissions compared to incumbent products
- Product LCAs are reviewed and approved by DOE's National Energy Technology Laboratory





UPGrants: LCA Process Expansion

DOE is bolstering resources and encouraging applicants to make use of the LCA review process established in support of the UPGrants program. This review process provides additional support and technical assistance to product manufacturers, program applicants, and technology developers in the carbon utilization space to develop product specific LCAs in accordance with the [FECM/NETL Guidance](#) and ISO standards.

The LCA review process established in support of the UPGrants program will provide:

- **Technical assistance** in the form of critical reviews to make progress towards LCA submissions required for IRS approval for the 45Q tax credit for utilization compliant with the FECM/NETL guidance for utilization products
- Preparation for submitting for **Environmental Product Declarations (EPDs)**
- Preparation for application to the UPGrants Program as an **Approved Vendor**
- **Feedback on first of a kind and novel technologies and processes for carbon conversion and utilization**

Technical assistance provided during this LCA review will **not** provide:

- Pre-approval for any program, certification, or tax credit, including the 45Q tax credit
- Feedback on theoretical manufacturing processes



LCAs: UPGrants vs. 45Q

UPGrants	45Q
<ul style="list-style-type: none">• Accepts submissions for novel or yet to be built projects	<ul style="list-style-type: none">• Project must be in operation
<ul style="list-style-type: none">• DOE/NETL approves and may review submissions with applicants	<ul style="list-style-type: none">• IRS approves LCA
<ul style="list-style-type: none">• Approved products will be publicly posted for use in UPGrants	
<ul style="list-style-type: none">• NETL tools/ resources available	



Contact

DOE UPGrants: UPGrants-vendors@netl.doe.gov

DOE 45Q LCA: lca45q@hq.doe.gov

IRS 45Q: lbi.eef.45qlca@irs.gov

Helpful Links and Contact Info

- Workshop materials – slides and video
 - <https://usea.org/event/doenetl-45q-carbon-oxide-conversion-lca-training-workshop-hybrid>
- NETL 45Q toolkit
 - <https://netl.doe.gov/LCA/CO2U/45Q>

DOE UPGrants: UPGrants-vendors@netl.doe.gov

DOE 45Q LCA: lca45q@hq.doe.gov

IRS 45Q: lbi.eef.45qlca@irs.gov

NETL CO2U Guidance Toolkit

- First released in 2019
- Supports funding recipients with their LCA requirements
- Fosters better decision-making for the U.S. DOE Carbon Conversion Program by providing consistent and transparent analysis and reporting structure
- Provides LCA guidance, data, and tools to LCA practitioners in the area of carbon conversion
- Contributes to the global discussion on carbon conversion LCA and LCA methods
- Toolkit site:
netl.doe.gov/LCA/CO2U

NETL CO2U LCA GUIDANCE TOOLKIT Version 2.1.0

 <p>CO2U LCA GUIDANCE DOCUMENT FOR THE U.S. DOE OFFICE OF FECM, VERSION 2.0</p> <p>Analysis requirements and instructions for using the supporting data and tools</p>	 <p>NETL CO2U LCA DOCUMENTATION SPREADSHEET</p> <p>Excel file that can be used to document data when not using openLCA</p>	 <p>TRAINING RESOURCES</p> <p>Provided to funding recipients to aid in modeling an LCA</p>
 <p>NETL CO2U OPENLCA LCI DATABASE VERSION 2</p> <p>openLCA database that includes NETL unit process data and an example CO2U LCA</p>		<p>45Q ADDENDUM AND TOOLS</p> <p>Information pertaining to the use of this toolkit in performing life cycle analyses in support of the 26 CFR § 1.45Q tax credit, including an addendum to the Guidance Document.</p>
 <p>OPENLCA CONTRIBUTION TOOL</p> <p>Excel template that translates openLCA results into required charts</p>	 <p>NETL CO2U LCA REPORT TEMPLATE</p> <p>Word report template for summarizing data and results</p>	<p>NETL ADDITIONAL DOWNLOADS</p> <p> Download Full Toolkit</p> <p> Patches, Archives, and Version History</p>

45Q Addendum

- NETL refined the CO2U guidance for 45Q-specific purposes
 - Technology Readiness Level (TRL) 8/9+
 - Applicability to any conversion pathway, including any product in any market (e.g. food and beverage)
- Addition of regulatory-specific impact method to LCI database and documentation spreadsheet
- Updated Report Template with taxpayer-specific language Released Feb, 2022
- All products reviewed and approved by DOE and IRS

45Q LCA GUIDANCE TOOLKIT

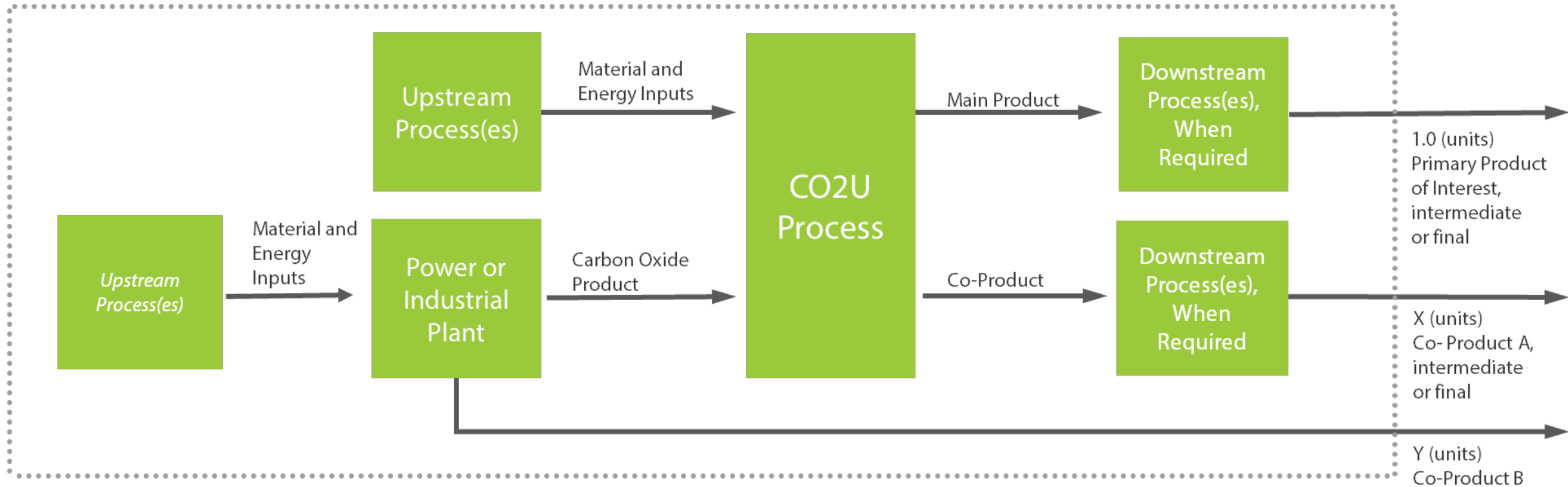
To be used in conjunction with version 2.1.0 of the NETL CO2U Guidance Toolkit

Released 02/23/22

NEW RESOURCES COMING SOON – SEE FAQ AND RESOURCES SITE.

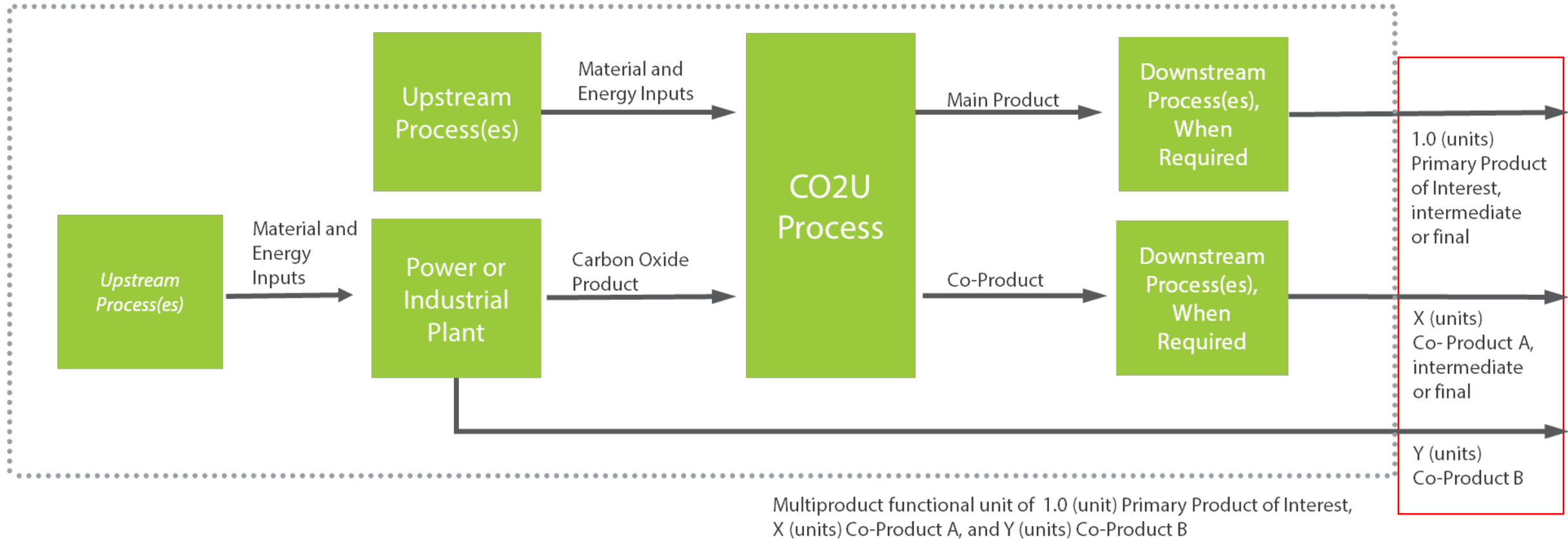
 <p>45Q ADDENDUM TO THE CO2U LCA GUIDANCE DOCUMENT</p> <p>Summary of modifications to the CO2U Guidance Document to be used to meet 26 CFR part 1, Section 1.45Q-4 carbon oxide tax credit</p>	 <p>NETL CO2U LCA DOCUMENTATION SPREADSHEET</p> <p>Excel file that can be used to document data when not using openLCA</p>	 <p>FREQUENTLY ASKED QUESTIONS AND ADDITIONAL RESOURCES</p>
 <p>NETL CO2U OPENLCA LCI DATABASE VERSION 2.1</p> <p>openLCA database that includes NETL unit process data and an example 45Q LCA</p>		 <p>ADDITIONAL QUESTIONS?</p> <p>Additional Questions should be directed to LCA45Q@hq.doe.gov</p>
 <p>OPENLCA CONTRIBUTION TOOL</p> <p>Excel template that translates openLCA results into required charts</p>	 <p>NETL 45Q LCA REPORT TEMPLATE</p> <p>Word report template for summarizing data and results</p>	<p>NETL ADDITIONAL DOWNLOADS</p> <p> Patches, Archives, and Version History</p>

Proposed Product System

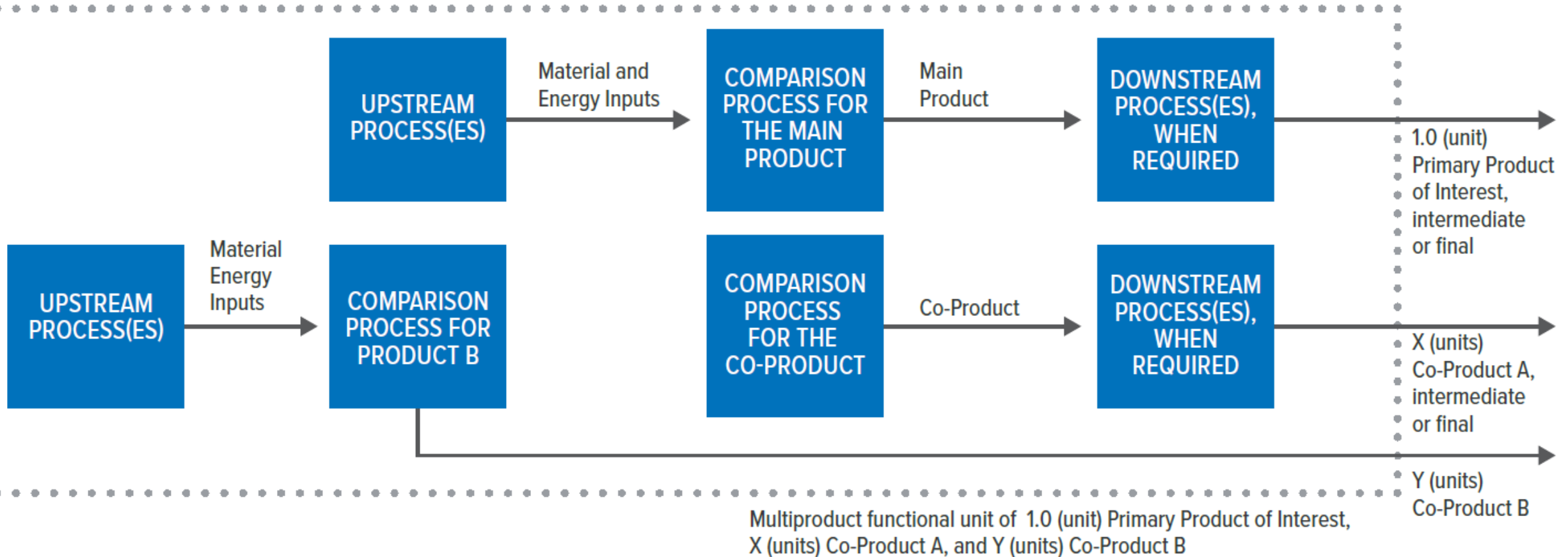


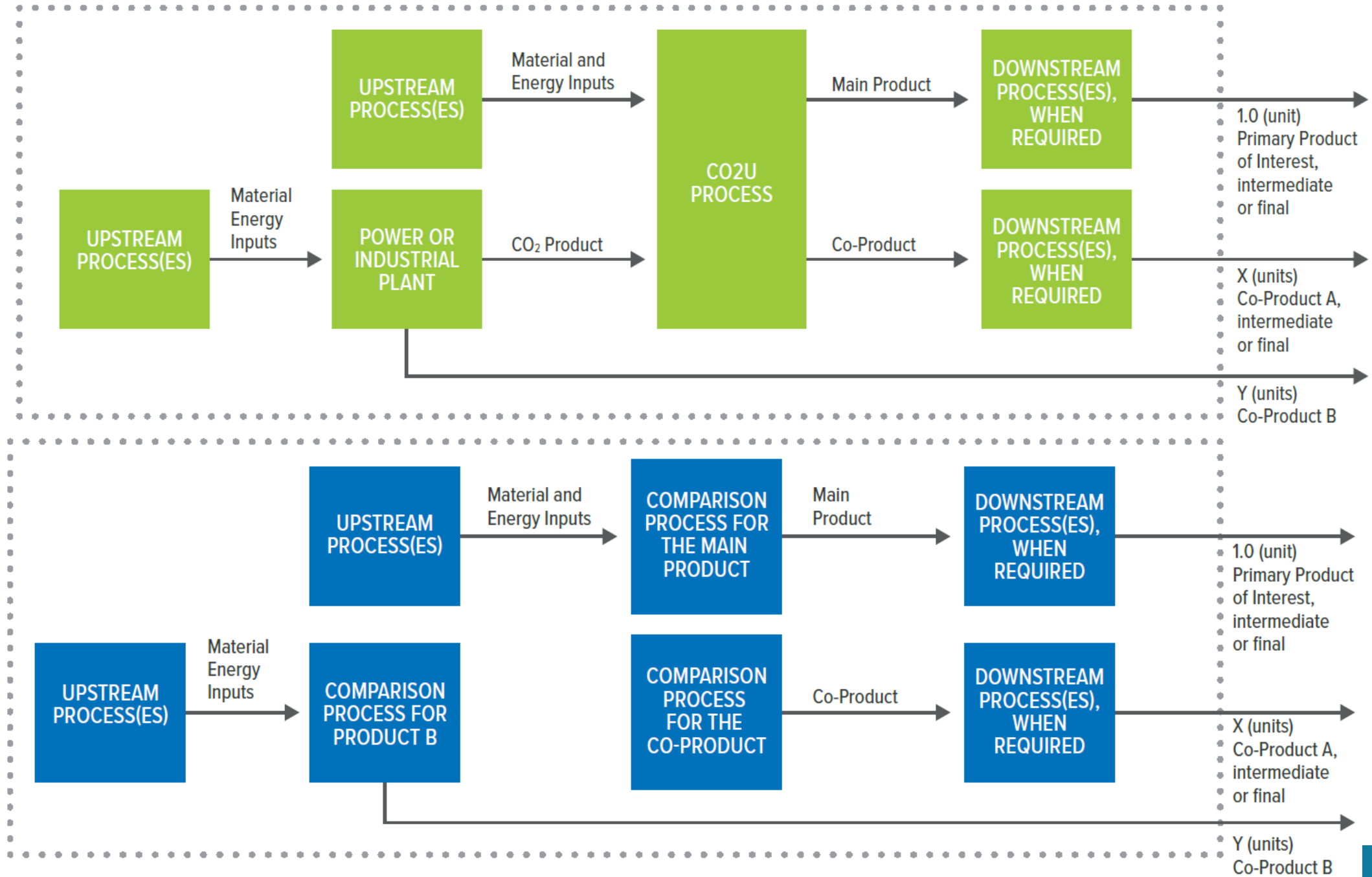
Multiproduct functional unit of 1.0 (unit) Primary Product of Interest, X (units) Co-Product A, and Y (units) Co-Product B

Proposed Product System

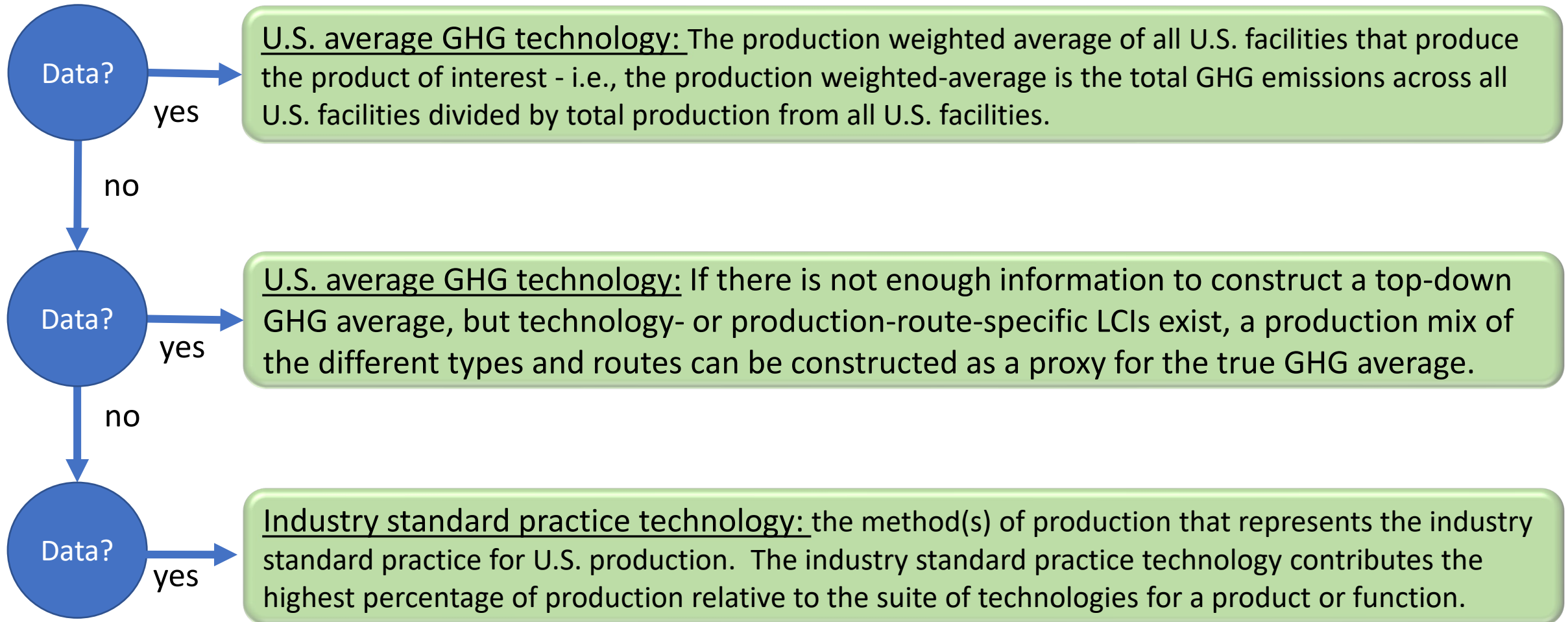


Comparison Product System





Comparison Product System Technology Choices



NEW! NETL U.S. Average Baseline Datasets



NETL U.S. Average Baseline Datasets



- Based on publicly available data
- Includes existing capture rates in industries
- Representing years 2018 – 2022
 - Will be updated as new data is available
- Documentation in complete report + supplemental data spreadsheet
- Data available in .zolca file compatible with CO2U LCI database
- Summary impact results will be available in next CO2U update

Results Calculations

Calculated using GWP impact values scaled to 1 metric ton carbon oxide captured and utilized:

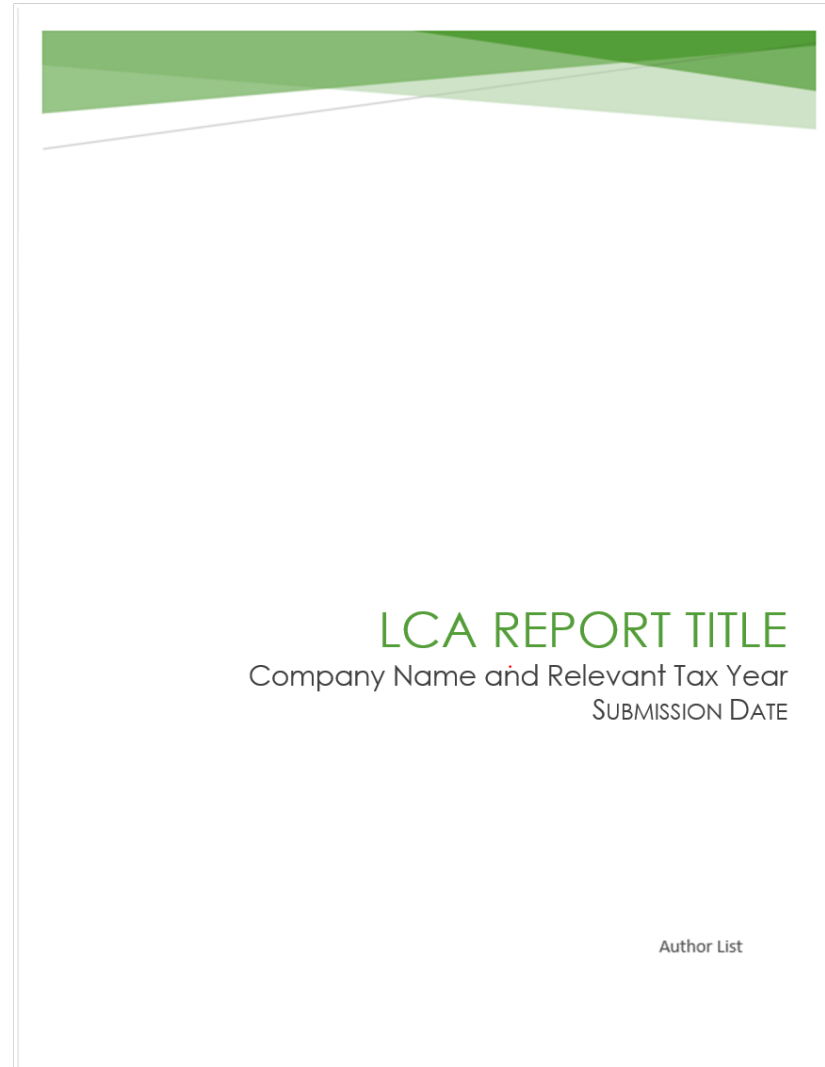
$$LC\ 45Q\ DF = \frac{\textit{Proposed Product System GWP Impact} - \textit{Comparison Product System GWP Impact}}{\textit{1 metric ton carbon oxide captured and utilized}} * -1$$

OR

Calculated using GWP impact values scaled to the functional unit:

$$LC\ 45Q\ DF = \frac{\textit{Proposed Product System GWP Impact} - \textit{Comparison Product System GWP Impact}}{\textit{Amount of carbon oxide captured and utilized per functional unit}} * -1$$

Results Reporting



NEW! Review Checklist

- Provides quick summary of key checkpoints
- Includes summary for each report section and what is expected
- Gives some context to typical NETL critical review

NETL 45Q LCA REVIEW CHECKLIST

This review checklist is meant to be used as a guide for 45Q applicants. Applicants must reference the [NETL CO2U LCA Guidance Document](#) and [45Q Addendum](#) for complete guidance on preparing LCAs for 45Q. The table below provides a high-level summary of the key checkpoints based on common issues in submitted LCAs reviewed to-date. The remainder of this document provides a thorough list of the items evaluated as part of the LCA technical review.

LCA Consideration	Key Checkpoint
Study Scope	✓ CPS represents the U.S. average GHG or industry standard practice technology per Section 2.1.3.2 of the 45Q Addendum
Functional Unit	✓ Functional equivalence between the PPS and CPS.
System Boundary	✓ Clear and complete system diagrams for the PPS and CPS with consistent system boundaries.
Carbon Oxide Source and Utilization	✓ Captured CO ₂ co-product in the PPS must be produced in an equivalent amount in the CPS using the guidance in Section 2.1.10 of the 45Q Addendum.
Technology Representativeness	✓ The CPS uses Section 2.1.3.2 of the 45Q Addendum to represent the U.S. average GHG or industry standard practice technologies.
Geographical Representativeness	✓ PPS and CPS have equivalent geographical representativeness; CPS electricity unit processes represent the same geographical location as the PPS.
Temporal Representativeness	✓ PPS and CPS sufficiently represent the application tax year.
LCIA Methods for Results	✓ GWP impact calculations utilize characterization factors from Table A-1 of 40 CFR Part 98 subpart A.
Modeling Platform	✓ A complete model is included as part of the submission, or in the case of a report that has been externally reviewed by a third party, the description of the model is sufficient to completely recreate it. Inclusion of a model diagram is recommended for all reports.
Data Sources and Quality Assessment	✓ Description of the CPS data and unit processes includes U.S. average GHG or industry standard practice justification.
Sensitivity Check	✓ Sensitivity analysis results show the variation of individual model parameters and break-even analysis highlights key sensitive parameters.
Co-Product Management	✓ Description of the co-product management procedure is clear and complete, and functional equivalence was established.
Interpretation	✓ LC 45Q DF has been calculated according to Section 2.1.9.3 of the 45Q Addendum. LC 45Q DF is stated as 1 if initial calculated DF is greater than 1.

EXECUTIVE SUMMARY

- High-level, overview of the LCA. This should include brief descriptions of the following:

Questions?

VISIT US AT: www.NETL.DOE.gov



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