Developing Publicly Available LCA Guidance, Data, and Tools for Environmental Understanding of Emerging CO2 Utilization Research

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Presentation Agenda

• Motivation for NETL Guidelines

• NETL CO2U LCA Toolkit Goals and Overview

• Understanding Our Audience

• NETL CO2U LCA Toolkit Contents

• Next Steps
Applications for Technologies Directed at Utilizing Carbon Dioxide from Coal Fired Power Plants (DE-FOA-0001622), states that the Principal Investigator (PI) shall provide

“…Life Cycle Analysis further demonstrating the potential of the proposed process to be a substantive CO₂ mitigation option, by verifying the lifecycle GHG reduction potential of the products(s) and technology (on a percent reduction basis) relative to current state-of-the-art pathways”
Motivation - CO2U LCA Requirements in U.S. Federal Programs and Policy

- **26 USC 45Q: Credit for carbon oxide sequestration (aka, 45Q)**
  - LCA (GHG analysis) required for tax credit (non-EOR utilization)
  - “(B) Measurement
    - (i) In general For purposes of determining the amount of qualified carbon oxide utilized by the taxpayer under paragraph (2)(B)(ii) or (4)(B)(ii) of subsection (a), such amount shall be equal to the metric tons of qualified carbon oxide which the taxpayer demonstrates, based upon an analysis of lifecycle greenhouse gas emissions and subject to such requirements as the Secretary, in consultation with the Secretary of Energy and the Administrator of the Environmental Protection Agency, determines appropriate…
NETL CO2U LCA Toolkit Goals

1. Provide LCA guidance, data, and tools to U.S. DOE Carbon Use and Reuse Program project PIs to complete their project LCA and documentation requirements

2. Foster better decision-making for the U.S. DOE Carbon Use and Reuse Program by providing an analysis and reporting structure for the project LCAs that allows for consistency and transparency

3. Provide LCA guidance, data, and tools to others seeking guidance on conducting LCA in the area of CO2U

4. Contribute to the global discussion on CO2U LCA and LCA methods
Understanding Our Audience and Focusing our Guidance

• How do we improve on clarity and specificity of existing guidance?
• How do we get accurate LCAs from technical personnel who are new to the framework?
• How do we minimize the effort for PIs to complete LCAs?
Understanding Our Audience and Focusing our Guidance

• How do we improve on clarity and specificity of existing guidance?
  • Guidance included in the NETL CO2U LCA Toolkit is ISO compliant
  • Additional guidance is helpful for handling CO2U systems to:
    1. **Understanding of feedstocks and technology pathways**
       Knowledge of application allows for more specific focus and guidance with answers defined for methodological choices
    2. **Ensure methodological consistency in applying the ISO standards**
       ISO standards provide a broad framework for applying LCA to a wide range of applications, which can lead to inconsistency
    3. **Define study goal & scope based on project Technology Readiness Level (TRL)**
       This guidance aims to assist principal investigators with the expectations of completing their comparative LCAs at different stages of technology development.
Understanding Our Audience and Focusing our Guidance

• How do we get accurate LCAs from technical personnel who are new to the framework?
  • Wide-range of expertise and experience in LCA – Novices to experts, juniors to consultants
  • Primarily coming from technical backgrounds and comfortable with process-based thinking
  • Guidance and data ensure consistency and repeatability:
    1. Consistent data for common inputs
    2. Instruction on LCA for novices
    3. Scenario development
    4. Methodological decisions
Understanding Our Audience and Focusing our Guidance

• How do we minimize the effort for PIs to complete LCAs?
  • Want to avoid burdensome requirements, while providing useful and actionable results for decisionmakers
  • Diverse set of technologies, but many commonalities such as feedstock
  • Structure the toolkit to provide guidance for all stages of the LCA
    1. Goal and Scope Identification
    2. LCI data
    3. Modeling
    4. Result Interpretation
    5. Reporting
Comparative LCA
LCA goal is to compare the CO2U system to the long-run marginal competitor in the market (comparison system)

Multiproduct functional unit with system expansion
Improve comparability and results interpretation

Default scenarios for CO₂ sources
Coal-fired power generation: flue gas, captured CO₂ greenfield and retrofit

Guidance for comparison processes and system
Data quality and representativeness: expectations based on TRL

Three modeling options
1. openLCA with provided data
2. Excel-based documentation sheet
3. Other commercial LCA modeling software

Interpretation requirements
Specific data/figures to provide consistency to study comparisons
The NETL CO2U LCA Guidance Toolkit

- Supports funding recipients with their LCA requirements
- Simplifies the process of LCA
- Improves consistency in communicating results
- Toolkit site: netl.doe.gov/LCA/CO2U
The NETL CO2U LCA Guidance Toolkit

GUIDANCE DOCUMENT
Analysis requirements and instructions for using the supporting data and tools

OPENLCA MODEL TRAINING
Provided to funding recipients to aid in modeling an LCA in openLCA

SUBJECT MATTER EXPERT SUPPORT
Available to funding recipients for all phases of the LCA from conception to documentation

Starting point for understanding LCA requirements

Training videos and live webinars will be available as developed at netl.doe.gov/LCA/CO2U

Contact us with questions at LCA@netl.doe.gov

netl.doe.gov/LCA/CO2U
The NETL CO2U LCA Guidance Toolkit

OPENLCA LCI DATABASE
openLCA database that includes NETL unit process data and an example CO2U LCA

OPENLCA CONTRIBUTION TOOL
Excel template that translates openLCA results into required charts

LCA REPORT TEMPLATE
Word report template for summarizing data and results

DOCUMENTATION SPREADSHEET
Excel file that can be used to document data when not using openLCA

PI CHOSEN LCA SOFTWARE OR SPREADSHEET SOFTWARE

netl.doe.gov/LCA/CO2U
LCA/TEA Workshop: Overview

- Gathering of government, academia, industry, NGOs on April 10-11, 2019
- Discussion of two guidance documents – UM Global CO$_2$ Initiative and NETL
- Exploration of metrics, best practices, validation
- Next steps for building global toolkit for measuring and reporting
- Target applications: project investment, product marketing, and policy needs
LCA/TEA Workshop: LCA Takeaways

1. General agreement on methods and approach
2. Graduated approach based on TRL; approaches for streamlining
3. Harmonization of data for life cycle inventories and scenario development
4. Standardization of terminology where possible
5. Impact assessment beyond global warming potential
6. Interest in guidance for policymakers, investors, etc. for reviewing LCA results
Conclusions

• CO2U systems are unique in that they combine two sectors (electricity and CO2U product)

• Consistent LCA approaches are necessary to ensure comparability and fairness

• The goal of the NETL CO2U Guidance is to determine the environmental preferability of utilizing captured carbon to produce products – this necessitates a consequential LCA approach
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